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Edited by
A. F. BASSET HULL, M.B.E., F.R.Z.S.
and TOM IREDALE, F.R.Z.S.

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HONEYEATERS OF THE SYDNEY DISTRICT
(COUNTY OF CUMBERLAND) NEW SOUTH WALES.

By K. A. HINDWOOD, F.R.Z.S.

(Plates viii.-xiv.)

(All photographs by the author unless otherwise stated.)

The family of birds known generally as Honeyeaters is distinguished by the fact that all its members have a protrusible and partly-cleft tongue, with a frayed brush-like tip, used for extracting nectar from flowers. Other kinds of birds have brush tongues which, however, differ structurally from those of Honeyeaters.

Their habits indicate a long association with a profusely-flowering indigenous flora, comprising, in Australia, trees of the genera *Eucalyptus*, *Banksia*, and many other trees and shrubs. They are attracted by almost all nectar-bearing blossoms, whether on native or introduced plants, and also live extensively on insects, fruit, pollen and other vegetable matter.

Honeyeaters are important agents in the fertilisation of plants. When seeking nectar, the feathers about the head of the bird become dusted with pollen from the anthers of the flowers. Some of these pollen grains will most likely come in contact with the mature stigmas of other blossoms, thus bringing about cross-pollination.*

A great diversity in size, coloration and external structure is apparent within the family. All the species have well-developed wings, comparatively long tails, and strong feet suited to an arboreal life. The bill structure varies from the short bill of the White-naped Honeyeater to the long, slender, curved bill of the Spinebill. In size they range from the small Blood-birds, which bear a resemblance to Sun-birds, to the Leatherheads and Wattle-birds, some fourteen inches in length. Several species have bare flesh or wattles about the face or head.

In the majority of species the females resemble the males, though, for the most part, they are slightly smaller and not so brightly coloured. A few exceptions occur, principally in the genera *Myzomela* and *Cissomela*, in several species of which the conspicuously marked males contrast with the plain females.

Almost seventy species are listed as inhabiting Australia and Tasmania. Many other species occur outside Australia, mainly on islands adjacent to the continent. A number of distinctive Honeyeaters also inhabit New Zealand. However, they seem to have attained their greatest development and diversity in structure in Australia. Habitats include all types of country where trees and shrubs grow—coastal jungles, forests, and heathlands.

The gregarious and nomadic instincts are well developed in many species and these aspects have been stressed in the notes which follow. It should be indicated that individuals, pairs, or small parties of species in which these traits are much in evidence, often remain constant to a

*For a detailed discussion on this aspect of bird life refer to "Relations between Birds and Plants," O. H. Sargent, *The Emu*, Vol. XXVII., 1928, pp. 185-192.

particular locality throughout the year. The whole matter is largely one of food-supply. A season of abundance will obviously result in a far greater concentration of birds than one of scarcity.

In so far as the Sydney district is concerned a large influx of Honeyeaters takes place during the autumn and winter months. Apparently many of these birds come from the highlands of the Blue Mountains to the west. They are attracted by the flowering trees and shrubs in coastal areas. On the heathlands, at this time of the year, the Yellow-faced, White-naped, Brown-headed, and other Honeyeaters mingle with the usual Honeyeater population of the heath. The movements and call-notes of such an assemblage are so striking that even a casual observer could not but pause and listen to the joyous voices and watch the birds.

This mingling of species brings to mind some pleasant memories. I recall a sandstone heath a few miles from Sydney on a sunny June day. Honeyeaters were everywhere and while watching them it was noticed that some Yellow-tufted, and Yellow-faced Honeyeaters, frequently flew from the low shrubs to an isolated tree. They were seen to be flitting about an old cup-shaped nest. Presently a "Yellow-face" flew to the nest and settled in it, remaining there for about half a minute; then another bird took its place. Scarcely any time passed without one or the other of the two species being at, or on the nest, which appeared to be that of a Rufous Whistler. They seemed to be indulging in a game of "follow-my-leader." While one bird was sitting the others would be in the branches close by uttering their cheerful notes.

The majority of Honeyeaters build cup-shaped nests. These may be flimsy and suspended (Painted Honeyeater), or substantial and supported (Regent Honeyeater). Some species build close to the ground (Tawny-crowned), others among the leafy foliage of saplings and tall trees (White-naped). No species normally builds on the ground or in the hollows of trees. In Australia two species, the Brown-backed and the White-breasted, build domed nests with a side entrance.

Certain kinds of Honeyeaters are favourite foster-parents of Cuckoos; for instance, the Pallid Cuckoo frequently lays in the nests of both the Yellow-faced and the Yellow-tufted Honeyeaters, and the Koel in the nests of Leatherheads.

The planting of as many nectar-bearing trees, shrubs and creepers as possible, to attract Honeyeaters, will amply reward the bird-lover. The deciduous coral tree (*Erythrina corallodendron*), which is a mass of scarlet blossoms during the autumn and winter months, is recommended where extensive grounds are available; it is too large and throws too much shade in summer for most home gardens. The coast banksia, or white honeysuckle (*Banksia integrifolia*) is another winter-flowering tree that attracts many Honeyeaters, though it takes a long time to reach maturity. Two excellent trees that flower in summer are the black-bean or Moreton Bay chestnut (*Castanospermum australe*), and the silky oak (*Grevillea robusta*). Among shrubs, the quick-growing bird flowers (*Crotalaria* spp.) are recommended. The range of suitable food trees is very extensive; those most suited to the soil and situation available should be planted.

I have known a flock of a dozen or so Red Wattle-birds take possession of a black-bean tree in a suburban garden during the entire flowering period—November and December—and drive away other birds seeking

nectar. The yellow and red blossoms of this tree grow on the outer branches, but are more or less concealed by the glossy dark-green foliage. The foreheads of the Wattle-birds became so dusted with pollen that the feathers appeared to be yellow.

The bills of several species of Honeyeaters are too short to enable them to extract the nectar from many blossoms. In such cases the birds will often perforate the base of the petals to obtain the honey. I have observed both the White-naped and the Black-chinned Honeyeaters doing this to *Crotalaria* flowers.

The following observations deal briefly with the twenty-nine species of Honeyeaters that have been recorded from the Sydney district which, for the purpose of these notes, may be regarded as the County of Cumberland. This area, of about 1,500 square miles, lies within a radius of some forty miles of Sydney. Broadly speaking, two main geological formations, the Hawkesbury Sandstone and the Wianamatta Shale series, chiefly comprise the geology of the county. There is a marked difference between the vegetation and climate of the two types of country, and these factors influence the distribution of many species of birds. The Wianamatta Shale consists of undulating country clothed in forest (much of which has been opened out or cleared by settlement) with comparatively little undergrowth except along the slow-moving creeks. On the other hand, the Hawkesbury Sandstone consists of rugged, broken country, largely covered with forest and heathland, and with thick undergrowth on the more sheltered hillsides and in the gullies.

The Wianamatta Shale is almost entirely surrounded by the Hawkesbury Sandstone. Actually, the "shale" extends a little beyond the western boundary of the county in a few places before it meets the sandstone foothills of the Blue Mountains.

The main types of vegetation, within the county, having a bearing on the distribution of Honeyeaters are referred to in these notes as "shale," "sandstone," and "brush," or "rain-forest," with the addition of "heathland," which occurs on sandstone plateaus and in certain areas of a sandy nature near the coast. Rain-forest vegetation is not extensive in the county; it occurs principally in association with fairly heavy and rich basaltic or alluvial soils in districts of good rainfall, and chiefly in the southern parts of the county.

Quite a lot of the coastal vegetation near Sydney has been destroyed by settlement or much reduced by the effects of bush-fires and wanton destruction. This is especially so with some of the favourite food trees of Honeyeaters. While we may regret this despoliation we can, in some small measure, make amends by planting the right trees in suitable places.

Twenty-one of the twenty-nine species recorded in these notes breed more or less regularly within the county. Two species, the Crescent Honeyeater and the Black Honeyeater, have been noted nesting once only. One, the Blue-faced Honeyeater, probably nests with us on occasions. The remaining five species are stragglers or irregular visitors to the county.

The occurrences of a few species are based on sight observations only; in such cases the evidence for their inclusion is stated. In most instances the various species are to be noted, at one season or another, in types of country suited to their habits.

Reference should be made to some comprehensive work on Australian birds for detailed remarks on distribution, nests, eggs, and habits generally. The following books may be consulted:—*The Birds of Australia*, Gregory M. Mathews; *Nests and Eggs of Birds found Breeding in Australia and Tasmania*, A. J. North; *Nests and Eggs of Australian Birds*, A. J. Campbell; *What Bird is That?*, N. W. Cayley. Numerous contributions on the habits of Honeyeaters have appeared in scientific journals. Some of these papers are listed at the conclusion of these notes. Attention is directed to an informative and detailed paper, "Notes on Honeyeaters," by P. A. Gilbert, in *The Emu*, Vol. XXIII., 1923, pp. 109-118.

The scientific names used are based on "A List of the Birds of Australasia," 1931, Gregory M. Mathews.

NOTES ON THE VARIOUS SPECIES.

White-naped Honeyeater. *Melithreptus lunatus*.

This dainty Honeyeater is, perhaps, better known as the "Black-cap." It occurs commonly throughout the county in forest country and frequently feeds among the outer-foliage of the tallest trees, also in saplings and shrubs. Some birds commence nesting as early as the end of July and the normal breeding season extends to January. In the autumn and winter months they move about in flocks of a dozen or more birds. The gregarious instinct seems to be most pronounced in May and June. G. R. Gannon noted (1933, p. 25) "a flock of at least one hundred" on May 14, and P. A. Gilbert recorded (1935, p. 204) sixty-two birds in one flock on May 25. These nomadic flocks are often seen on heathlands seeking nectar from flowering banksias and other shrubs. The small patch of bright orange-scarlet skin above and behind the eye seems to become duller (orange) in the non-breeding season. The usual call-notes are, a lisping chatter resembling the sound made when one attempts to say the word "cheep" with one's jaws closed; and a single plaintive note. Nests are usually built amongst leafy foliage up to forty feet from the ground, but are sometimes as low as ten feet or less.

Black-chinned Honeyeater. *M. gularis*.

(Plate viii.)

Superficially, the Black-chinned Honeyeater resembles the White-naped, but the following characters distinguish it: larger size; a more pronounced white nape band, a black wash under the chin, and bright blue, bare flesh above and behind the eye (red in the White-naped Honeyeater). The usual call-note is quite distinctive and loud, a kind of continuous double chatter. This species is sparingly distributed throughout the open forests of the shale areas of the country, where it breeds, and seems to occur in sandstone forests but rarely, and then only as a wanderer or nomad.

I once saw a Black-chinned Honeyeater secure a caterpillar which was immediately taken from it by a Fuscous Honeyeater feeding in the same sapling. Nestlings a few days old were seen to be fed on caterpillars and on what appeared to be nectar. I have noticed birds searching the bark on the trunks of trees for insects, after the manner of Shrike-Tits. Like other Honeyeaters with short bills, they will perforate near their bases blossoms with long corollas in order to extract the nectar. At Epping on June 15, 1940, a bird was observed doing this to *Crotalaria* flowers and similar actions,

by this Honeyeater, have been recorded in the case of a *Tecoma* creeper (*T. radicans*) (1911, p. 254).

During the autumn and winter months they move about in small flocks. The normal breeding season extends from July until December, though P. A. Gilbert has recorded (1937, p. 29) the species as breeding regularly in the autumn at Bankstown. The deep cup-shaped nest is built of bark fibres interwoven with hair, fur, or wool, giving it, externally, the appearance of teased wool; it is thickly lined with hair or fur. The character of the nest, with innumerable fine hairs protruding from it, is clearly shown in the accompanying photograph. In settled districts hair is often taken from the backs of domestic animals, such as cows. The situation chosen for the nest is usually amongst the outer foliage of saplings or taller trees from about twelve to sixty feet above the ground.

Brown-headed Honeyeater. *M. atricapillus*.*

The appearance of this species suggests a very faded example of the White-naped Honeyeater which bird it resembles in habits generally; also it has a similar distribution within the county, though it is not so numerous. The feathers of the head, crown, and about the face are dull brown; the nape band is pale grey and not very pronounced, and the bare skin above and behind the eye is greenish-yellow, duller in the autumn and winter. It frequents forest country in the breeding season, normally from August to December, but sometimes a little earlier. I once observed a young bird, out of the nest, being fed as late as April 5; this suggests that some birds may breed during the autumn. Small flocks of seldom more than a dozen birds move about in the autumn and winter and are often seen on heathlands at this time of the year.

A friend told me how four Brown-headed Honeyeaters, seeking nesting material, vigorously pulled wool from his jumper and hair from his head. Some years ago I was much amused by the actions of one of these Honeyeaters stealing fur from a possum sleeping in a hollow spout of a gum tree. The bird would enter the horizontal spout, go to the possum, a distance of about three feet, secure a few strands of fur, return to the entrance, look around suspiciously to see if all was well, and then return to the dozing possum; and so on until sufficient material had been gathered. Obviously the semi-darkness of the hollow limb disturbed the bird. The nest was amongst the topmost foliage of a red gum (*Angophora*) some forty feet above the ground and almost two-hundred yards from where the bird was gathering fur.

Blue-faced Honeyeater. *Entomyzon cyanotis*.

This is a rare bird in the county. It is represented among collections of bird paintings done during the first years of settlement at Sydney, one hundred and fifty years ago. Even in those far-off days it was considered "rare and curious" (1906, p. 136). Later, George Caley, who collected natural history specimens, mainly for Sir Joseph Banks, near Sydney, during the years 1800-1810, remarked: "Whether it is migratory or not it would be hazardous for me to say; as I have only seen it occasionally, although in

*See *Austral Avian Record* (Vol. III., No. 2, November 19, 1915, pp. 25-30, pl. 11) in explanation of the change of the specific name of this species from *brevirostris* to *atricapillus*.

different places. I once observed several of them frequenting a tree, where they were busy in obtaining something that appeared to have exuded from a wounded part. I do not know what the substance could be, otherwise than a kind of gum of a bitter and astringent taste" (1827, p. 325). Many years elapsed before the species was again recorded; in July, 1869, a specimen (No. 0.21658, ♂, Australian Museum, Sydney) was collected at Rope's Creek. It has been infrequently recorded from the county since that time. Mr. E. Nubling has observed this species at Palona Creek, National Park (21/8/1921); at Gundamaian, National Park (April, 1922) and recently he observed from six to twelve birds feeding in a flowering gum tree near Wahroonga (28/2/1942); several were seen in the same place a few days later. Some years ago, November 4, 1934, Mr. M. S. R. Sharland noted an adult feeding an immature bird at Kellyville, indicating the probability of the species having nested in that district.

Striped Honeyeater. *Plectorhamphus lanceolatus*.

The Striped Honeyeater is an extremely rare bird near Sydney. A specimen was collected at Newington in July, 1881, by the late Mr. John Waterhouse (1937, p. 66). Recently, Mr. P. A. Gilbert observed a single bird feeding in a fruiting loquat tree at Lakemba (12/9/1942); this bird remained for about half an hour and then disappeared. On April 5, 1930, I watched a Striped Honeyeater feeding in a patch of coast banksias at Ettalong, which is beyond the borders of the county and some thirty miles north of Sydney. It was being harried by Brush Wattle-birds and Noisy Friar-birds; the enmity shown to this bird indicated that it was a stranger. In New South Wales the Striped Honeyeater is largely a bird of the inland areas. However, small nesting colonies occur in north-eastern coastal areas (1923, p. 32).

Scarlet Honeyeater. *Myzomela dibapha*.

This is one of the most beautiful and one of the smallest of the Honeyeaters. The male is a little gem of brilliant scarlet and black (grey on the lower underparts); the female is brownish and grey, often with a slight rusty wash about the face and chin.

The occurrence of these birds in various localities seems to be associated with the flowering of particular trees. On the North Shore line they appear when the turpentine trees (*Syncarpia laurifolia*) blossom in September and October. In the shale country, west of Sydney, they come about when the paper-barks (*Melaleuca* spp.) are flowering. The sweet tinkling notes of the species are pleasant to hear, though the birds may be invisible among the thick foliage of some lofty tree.

In the autumn and winter they are nomadic and often visit the heathlands to sip nectar from the banksias, or some flowering forest gum tree. Their numbers vary a good deal from year to year. During the great inland drought of 1902 what may be regarded as an irruption of "Blood-birds" occurred in the Sydney coastal districts. In May and June of that year they were observed in hundreds and by far the greater number seen were adult males. A. J. North records (1906, p. 92) that Mr. H. Newcombe saw some boys near Cook's landing place at Kurnell, Botany Bay, with about thirty birds that they had killed with sticks and stones.

Nesting may commence as early as August and continue until January. The nest, a small cup of reddish bark and rootlets held together with

spiders' webs, is generally built at no great height from the ground. A pair of birds that nested at Wahroonga some years ago reared three families in succession (1930, p. 264). Female birds are very unobtrusive and are seldom seen except when nesting.

Black Honeyeater. *Cissomela nigra*.

The evidence for the inclusion of the Black Honeyeater in a list of the birds of the Sydney district is based on sight observations only. Mr. Neville W. Cayley tells me that about the year 1902 (a period of a great inland drought) he found a nest of this species in a patch of burnt-out scrub near Bundeena, National Park. Later the eggs were supposed to have been collected by the late A. J. North, but North makes no mention of the circumstances in any of his writings, nor can the eggs be traced. Many years ago, Mr. Henry Grant saw a few of these birds at Haberfield, then largely bush, at the same time that large numbers of Scarlet Honeyeaters invaded an area of wattle trees in that district. About November 15, 1940, Mr. H. Pier, a keen bird observer, saw a male Black Honeyeater in his garden, near Penshurst, where it was seeking nectar from flowers. As far as I can trace no specimens of this bird have been taken near Sydney but, as the species appears to be largely nomadic, there is no reason why it should not occur in coastal areas occasionally; especially if drought conditions prevail inland. It is, for the most part, a bird of the interior.

Spinebill Honeyeater. *Acanthorhynchus tenuirostris*.

Spinebills must be the best known of the Sydney Honeyeaters. They are constantly flitting about the shrubs of home gardens and assume some unusual attitudes when seeking nectar and insects from the blossoms. Often they hover in front of a flower, like a humming-bird, probing for nectar. Few birds are as active as the Spinebills, restless and alert, they seem to be always in a hurry, late for every appointment with the blossoms.

In flight their rapidly moving wings make a peculiar sound, a fact which was noticed by the early colonists of Sydney, some 150 years ago. On a painting of the species in the British Museum are the following remarks: "This bird lives on flies and honey. When flying it makes a singular noise as if the tips of its wings were beat together under the bird's belly. It hovers over flowers and extracts honey with its brush tongue" (Watling painting No. 103, circa 1790). The reference to flies is interesting as recent observers have noticed that young Spinebills seem to be fed largely on flies, particularly blow-flies (1935, p. 99).

This species is well distributed throughout the county and is more or less stationary. The nest, well-built and cup-shaped, is warmly lined with feathers and is built among thick foliage or creepers and is seldom more than twenty feet from the ground. The nestlings are very noisy when being fed.

Tawny-crowned Honeyeater. *Gliciphila melanops*.

(Plate ix. (b)).

The Tawny-crowned Honeyeater is largely a bird of the sandstone heaths and scrub covered coastal sand dunes. It prefers dry, open heathlands and scrubby wastes; the kind of country often called "desolate" but which holds many attractions for the naturalist. Only occasionally is it found away from such places.

In early spring they congregate in small flocks and it is a delightful experience to listen to them singing on a spacious heath; a heath carpeted with boronias, grevilleas, banksias and many other beautiful flowers. I have strolled along a bush track in the half-light before dawn, the "false-dawn" some call it, listening entranced to the rather melancholy, flute-like notes of many Tawny-crowned Honeyeaters, but seeing not a bird in the dimness. There is no sequence about their calls. The plaintive notes seem to be uttered haphazard, and they have a wistful tone that reminds one of the Bush Canary (White-throated Warbler) of the forests.

Often they will fly upwards fifty feet or more in the air and sing as they flutter down to earth. The nest is usually placed within a few inches of the ground and is well concealed amongst grass or shrubs. It is cup-shaped and built of strips of old bark, blades of dry grass, and finer grass stalks. Often it is lined with the white downy substance from the seed cases of some common heathland shrub, such as *Petrophila* or *Isopogon*. Nests have been found throughout the year, though the normal breeding period appears to extend from August to January. Young birds are striped about the head and underparts and keep much to the ground or low bushes.

White-fronted Honeyeater. *Purnella albifrons*.

The White-fronted Honeyeater has been recorded but once from the county. In the Australian Museum collection there is a specimen (ex the "Dobroyde" collection), No. 0.21661 adult ♂, "obtained in the scrub at Middle Harbour in 1878" (1906, p. 75).^{*} This is the only recorded instance of the occurrence of this species in coastal New South Wales, where it is considered a bird of the inland.

Painted Honeyeater. *Grantiella picta*.

(Plate x. (a)).

This interesting Honeyeater is a rare bird in the county. It has a wide range throughout eastern Australia, but nowhere does it appear to be common. It has been recorded from the south-east portion of the continent (N.S.W. and Victoria), principally during the spring and summer months, though a few birds may linger as late as March or early April.

Painted Honeyeaters live largely on mistletoe berries and feed them to their young. With a bird so highly specialised any variation in the food supply would have a direct bearing on its movements. Thus there are reports of its appearance in localities where it has not previously been seen, and its re-appearance for several years until unfavourable conditions occur.

Most of the records of the occurrence of this species near Sydney are from shale areas. This is because of the abundance of mistletoe growing in those parts. In the sandstone this tree parasite is not nearly so common. The Painted Honeyeater has been found nesting on a number of occasions in various parts of the county, mostly towards the end of summer. The lateness of the nesting season is no doubt associated with the ripening of the mistletoe berries. The birds are fond of the berries of the mistletoes, *Loranthus cambagei* and *L. gaudichaudi*, and have been observed feeding among the flowering cones of a *Banksia* (1920, p. 273).

^{*}Dr. E. P. Ramsay, in his notebook under date July 12, 1886, when referring to unusual occurrences of birds near Sydney gives the locality where this specimen was taken as Manly, i.e., "shot at Manly." See A. H. Chisholm, *The Emu*, Vol. XXXII., pt. i., July, 1932, p. 64.

The nest is a shallow net-like cup, so open that the eggs are visible through the structure. It is usually built among the drooping outer-foliage of a tree and is seldom less than twenty feet from the ground. The nest is so frail that it is sometimes impossible to see it among the leaves. Favourite nesting trees near Sydney are she-oaks (*Casuarina* spp.) and paper-barks (*Melaleuca* spp.).

The mistletoe berries are skinned before being given to the nestlings. The parents are careful to keep the nest clean and they diligently search for seeds voided by the young birds. This is necessary to prevent the nest from being fouled by the partly digested berries which still have much of the sticky flesh adhering to them. The parents generally swallow the seeds passed by the nestlings.

The call-notes vary considerably. The usual call is a loud double whistle, best expressed by the word "geor-gee" with the accent and inflection on the second syllable. The birds also utter another call in which the last syllable is lower in tone than the first. A loud single note is sometimes given; also a soft chattering call when they are at or near their nests.

Some recorded nesting areas within the county, during the past twenty-five years, include Richmond, Wallacia, St. Mary's, and National Park. In the latter locality, Mr. E. Nubling watched a Painted Honeyeater building its frail cradle in a *Casuarina* tree near Palm Creek, on October 24, 1924.

A distinctive character of this species not possessed by any other Honeyeater is the colour of its bill, which is a deep pinkish-red, paler towards the tip.

Regent Honeyeater. *Zanthomiza phrygia*.

(Plate xi. (b & c)).

The Regent Honeyeater is attractively clothed in glossy black, offset with pale yellow on the back, wings, tail and underparts. It was, at one time, called the Warty-faced Honeyeater from the nature of the bare flesh surrounding its eyes.

This species breeds in the forests of the shale country west of Sydney and in the forests of the shale cap in the Pymble-Wahroonga district. It is largely nomadic and in some years is rarely observed in the county. In favourable seasons there is a pronounced coastal movement during the autumn and winter months, when the birds are attracted by the flowering banksias and eucalypts of the heaths and forests. Winter flocks may number fifty or more birds. They are of an aggressive nature, even in the non-breeding season. Their food consists largely of nectar, insects and cultivated fruits. Some of the call-notes are harsh and unmusical, though low-toned, bell-like notes are frequently uttered.

Brown Honeyeater. *Lichmera indistincta*.

The distribution of the Brown Honeyeater near Sydney seems to be curiously restricted. Nearly all the records of its occurrence centre about Botany Bay (including Cook's River and George's River), Port Hacking, and the Parramatta River. Extensive areas of mangroves are growing in all these areas. This species is very partial to mangrove forests when breeding but, like many other Honeyeaters, moves about in the autumn and winter months in search of food.

Many years ago the Brown Honeyeater was recorded from Ashfield, Burwood, and Dobroyde (Ramsay's Bush). These places are too settled nowadays to attract the birds, though they have been observed recently in the mangroves at Homebush Bay, which is a nearby locality. This species occurs in the mangroves and adjoining coastal forests at Quibray Bay, and Weeney Bay, near Kurnell. On October 24, 1943, adult birds were observed feeding a fledgeling in the mangroves at Quibray Bay. A nest of the Brown Honeyeater was found in the mangroves at Salt Pan Creek, George's River, in August, 1930, by Norman King (1935, p. 187).

In the winter of 1930 a pair of Brown Honeyeaters frequented the Sydney Botanic Gardens for several weeks and were often seen feeding on the nectar in the blossoms of a bird flower (*Crotalaria laburnifolia*). Honeyeaters, as a group, are not noted for pleasant songs. The Brown Honeyeater is an exception. Its rich melodious notes are surprisingly loud for such a small bird, barely six inches in length, and resemble those of the Reed Warbler. Other notes, of a harsh chattering nature, are very similar to some of the calls of the Fuscous Honeyeater. The bird itself is quite plain, being mostly of a brownish colour, with a small patch of white feathers, and a smaller tuft of yellow hair-like feathers behind the eye. The wing and tail feathers are edged with green.

Fuscous Honeyeater. *Paraptilotis fusca*.

(Plate xi. (a)).

The Fuscous Honeyeater is a common breeding species in the forests of the shale areas of the county. It does not appear to breed in the surrounding sandstone forests. At the approach of autumn numbers of these birds move towards the coast, being attracted by the flowering banksias, and the blossoms of other trees. They are rarely seen in the sandstone after August. Their food consists of such items as nectar, insects, leaf-scale, caterpillars and mistletoe berries. Near habitations they can be attracted by bread and other food scraps and become quite tame, even searching the refuse bin for morsels (1922, p. 154).

The general coloration is brownish, lighter below, with a greenish tinge of the wings and tail. A small patch of yellow feathers behind the eye is the most prominent marking. The bill is light brownish with a black tip.

Yellow-faced Honeyeater. *Paraptilotis novaehollandiae*.*

(Plate xi. (d)).

The Yellow-faced Honeyeater is well distributed throughout the county during the breeding season. It is gregarious and nomadic in the autumn and winter months, and at this time of the year flocks may number from a few to a hundred or more birds. P. A. Gilbert records (1935, p. 204) several hundred birds in company at Waterfall on June 29, 1925; and a loose flock, aggregating about 1,000 birds near Lakemba on May 6, 1936 (1937, p. 30). There is probably a large influx of birds from areas beyond the county in the non-breeding season. Heathlands are favourite haunts of these wandering parties. In some years many birds frequent the Moreton Bay fig trees in Sydney parks when these trees are fruiting. They are fond of cultivated fruits and are considered a nuisance by orchardists.

*See Mathews, G. M., *Australian Zoologist*, Vol. X., pt. ii., April 30, 1943, p. 164.

The nest is a neatly-woven deep cup, generally with pieces of green moss attached to the outside; it is often built in a small tree or shrub near a creek, at other times in a large tree and may be forty or fifty feet from the ground. The call-notes are pleasant enough, though hardly melodious. A care-free "chick-up," repeated several times, is frequently given, also a single "chick," repeated five or six times and dropping in tone with successive notes. In flight the birds often utter a single high-pitched note.

The general coloration is brownish, lighter below. A yellow stripe extends from the base of the bill to behind the eye; this is bordered above and below by lines of black.

Yellow-eared Honeyeater; Lewin Honeyeater. *Meliphaga lewinii*.

The Yellow-eared or Lewin Honeyeater inhabits rain-forests or jungles, and the damp heavily-timbered gullies of the sandstone areas, particularly where Lilly-pilly (*Eugenia*) and Coachwood (*Ceratopetalum*) trees abound. It also occurs where thickly-foliaged trees are growing, often close to habitations, especially during the autumn and winter months.

Nests are built among thick foliage at no great height from the ground. Large dead leaves are generally used in forming the outside of the base and on occasions scraps of paper are built into the nest. A nest found at Gordon some years ago had several pieces of newspaper built into it and on one of these the word "nest" was visible; the word preceding this was "crows," but, as no self-respecting Honeyeater would admit that its home was a crow's nest, the birds had concealed the first word by another piece of paper. A photograph of this curious nest was published in *The Emu* (1932, p. 230, pl. 41). The nest lining consists of a thick matting of plant down, often from the bolls of the wild cotton plant. The birds feed on nectar, soft fruits, wax scale and insects, some of which are quite large, such as beetles and cicadas.

The general coloration of the birds is dull greenish, darker about the head, relieved by a prominent patch of pale yellow behind the eye; the gape is yellowish. The call has been described as a "prolonged quavering note"; it always reminds me of a postman's whistle.

White-eared Honeyeater. *Nesoptilotis leucotis*.

(Plate xii.)

This species is widely distributed throughout the county, but nowhere is it common. Heathlands and rather barren ridges, where the dwarf apple-gum (*Angophora cordifolia*) grows are its favourite haunts in sandstone country. In shale areas it frequents, for the most part, tracts of low stunted vegetation and sapling scrubs.

During the hot, dry days of late summer and the inclement weather of winter, White-eared Honeyeaters often leave their breeding haunts and seek food and shelter in the nearby forests. However, such movements appear to be very limited. Many birds will remain in the one locality throughout the year.

Several species of Honeyeaters are known to seek hair or fur from animals, as well as man, for their nests, but in none is this habit more pronounced than in the present species. In the old days, when a sparse aboriginal population roamed the bush near Sydney hunting animals, there had arisen a state of balance, comparatively static, between the native and his environment. In consequence, animals like the kangaroo, wallaby,

bandicoot and possum, managed to survive in fair numbers. Here, then, was an ever-present supply of nesting material for the White-eared Honeyeaters.

With the coming of the white man and his deadly destructiveness with fire-arms, the animal population was greatly decimated. Thus, we have the spectacle near settled areas of the birds turning to introduced animals for the desired nesting material.

Examination of many nests has revealed that they have been lined with hair from dogs, pigs, goats, cows, horses, deer and from rabbit skins, in addition to fur from native animals. Strands from hessian and rope are also used. I have a record of White-eared Honeyeaters taking fibres from a blanket hanging on a clothes line at Lindfield (August 14, 1938).

Where man is concerned the birds will perch on his clothing or head in search of nesting material. In my experience it has always been the female bird that does this; the male prefers the role of an onlooker. Many photographs and even films have been taken of such incidents.

In some localities, such as the snow country of the highlands of the Blue Mountains, nests may be built in grass tussocks. Near Sydney they are usually placed in shrubs or low trees and are seldom more than ten feet from the ground. The normal breeding season extends from late July to January. Odd pairs sometimes nest at other times of the year as is shown by the following records:—March 19, 1933, Castle Cove, Middle Harbour, feeding young; May 25, 1930, Roseville, Middle Harbour, building.

Like many species of birds that nest on or near the ground, White-eared Honeyeaters will feign injury when disturbed from their nests in an effort to entice an intruder away. In at least one recorded instance this species simulated death (1917, p. 110).

Yellow-tufted Honeyeater. *Lophoptilotis melanops*.

(Plate x. (b)).

These beautiful Honeyeaters are found throughout the county, though their distribution is somewhat uneven. They occur in small, loose colonies and frequent the same areas for years; they are very partial to certain types of country.

Their usual haunts are hillside forests with rather thick undergrowth; sapling scrubs, and open forests where there is plenty of low growth in the form of shrubs; habitats best classified under the general term of "bushland." At times they are to be observed on heathlands feeding on the banksias, more so when this type of country is adjacent to their breeding haunts. Favourite food trees, from the blossoms of which they sip nectar, are spider-flowers (*Grevillea* spp.) styphelias, bottle-brushes (*Callistemon* spp.) and the honey-flower (*Lambertia formosa*). Swarming white-ants, which are eaten by many kinds of birds, are often captured on the wing, while the bark on the trunks of trees is searched for insects. Gum exuding from a wound in a smooth-bark *Eucalyptus* irresistibly attracts them. At Milson Island, Hawkesbury River, many Yellow-tufted Honeyeaters, together with five other species of Honeyeaters (Yellow-faced, White-eared, White-naped, Brown-headed, and Regent) were observed eagerly licking the yellow "sap" from a large wound in a grey gum (*E. punctata*). This substance, when analysed, was found to contain, as its main constituent, the sugar known as raffinose or melitose (1910, p. 52).

Yellow-tufted Honeyeaters are very sociable and as many as twenty or more birds will assemble and, with much movement of wings and tails, will chatter and flutter among the branches (1920, p. 91; 1922, p. 96).

Nests are generally built from one to fifteen feet above the ground in ferns, creepers, shrubs or saplings. In a nesting colony at Wahroonga, covering an area of about three acres, some fifteen nests were found in the young growth sprouting from felled *Eucalyptus* trees (1922, p. 148). The breeding season extends from June to December, or January, with odd pairs nesting in the autumn if the weather is mild.

A pleasant memory of bush days is the sight of several Yellow-tufted Honeyeaters fluttering in the outer foliage of a sapling, bathing among the dew-laden leaves at sunrise on a spring morning.

White-plumed Honeyeater. *Ptilotula penicillata*.

The White-plumed Honeyeater, or "Greenie," occurs in the county mainly during the autumn and winter months. The absence of sufficient data does not permit of any definite conclusions as to its status with us. It seems to be an irregular and uncommon visitor to the Sydney district. Apparently the birds observed are wanderers from places west of the Blue Mountains, where the species is common. Its occurrence in the county may be associated with adverse conditions in its normal range. P. A. Gilbert records (1935, p. 205) it as rather plentiful during April, 1934, in the Sutherland-Menai area, and states that at that time "The summer and autumn were exceptionally dry in some parts of the west." Other recorded localities and dates are:—Helensburgh, 10/6/1916 (several specimens in the Australian Museum); Douglas Park, 3/4/1938 (several); and Balmoral, 9/12/1939 (a few). The date of this last record is unusual. The birds were observed in a patch of open forest. I do not know of any nesting records for the county.

The White-plumed Honeyeater resembles the Fuscous Honeyeater. The main distinguishing characters are a greenish wash about the face, head, and neck, a black bill, and a tuft of white feathers on the side of the neck. In the Fuscous Honeyeater the feathers on the head and neck are darker, the bill is parti-coloured, and the tuft of feathers on the side of the neck is yellow. The usual call-note of the "Greenie" is a loud whistle, best rendered as "chickoweet." The species normally inhabits forest country.

Crescent Honeyeater. *Phylidonyris pyrrhoptera*.

The Crescent Honeyeater, also known as the "Horseshoe" Honeyeater from the crescentic marks on either side of the breast, is a comparatively rare bird near Sydney. It appears to visit the coastal areas during the autumn and winter months, that is, from April to August, in small parties, or pairs. It frequents the thick under-bush in forest country, principally along the creeks and waterways of the sandstone. The species is common in the valleys and gorges of the Blue Mountains, west of the county, and in similar situations on the Illawarra range to the south. Apparently some of the birds from these localities visit the lowlands after the breeding season. Odd pairs may remain to nest in parts of the county; this is indicated by the record of a pair found breeding at Waterfall on October 18, 1899 (1906, p. 71). The nest was built at the base of a low scrubby bush amongst a heap of flood debris and contained two eggs. The call-notes of this lively

bird are loud and harsh; the main call resembles the word "Egypt," with the accent on the last syllable.

White-bearded Honeyeater. *Meliornis novaehollandiae*.

The White-bearded Honeyeater is the commonest of our heathland Honeyeaters. It is largely a bird of the dry sandstone heaths, scrub-covered sand dunes, and the rather stunted forests close to the coast. Much of its time is spent amongst the banksias of these areas, and especially the heath-leaved banksia (*B. ericifolia*). The dense foliage of these bushy shrubs provides suitable nesting places, and the flowering cones a plentiful food supply.

Generally speaking, White-bearded Honeyeaters are stationary, though some birds appear to move about in search of suitable food trees, perhaps a flowering *Eucalyptus* or a coral tree clothed in scarlet blossoms. They were very numerous in the large fig trees of Hyde Park and other public parks and gardens of Sydney during January and February, 1902 (1906, p. 60). This was a period of drought which had apparently driven the birds from their usual haunts.

This species can always be recognised by its white iris and a white beard of hair-like feathers on the throat; immature birds have a dark iris. Nests have been found throughout the year though, according to A. J. North (1906, p. 61), more frequently during the months of August, September and October, and again in April and May, thus indicating two main breeding seasons, with odd pairs nesting during late summer and winter. Nests are generally built in shrubs, particularly banksias, and are lined with soft brown velvety down from dead *Banksia* cones. Several pairs of birds may nest in close proximity without showing antagonism.

White-cheeked Honeyeater. *Meliornis niger*.

A noisy, showy bird, much like the White-bearded Honeyeater in plumage and habits but rather more local in its distribution than that species. It may be recognised by a prominent fan-shaped patch of white feathers, which can be elevated slightly, on the sides of the neck, commencing just below the eyes.

The White-cheeked Honeyeater inhabits swampy undergrowth in forest country, creeksides overgrown with a tangle of banksias, sword grass and ferns, and the more luxurious parts of heathlands. It avoids, for the most part, the dry heaths frequented by the White-bearded Honeyeater. They are much given to flying fifty feet or so in the air, chattering the while, and of perching on an elevated part of some shrub.

This species is largely a bird of the sandstone and is rarely seen in shale areas. Not infrequently White-cheeked Honeyeaters visit suburban gardens to sip nectar from the blossoms of various trees. Red bottle-brushes (*Callistemon* spp.), both in a wild and cultivated state, are especially attractive to them.

The nest is very similar to that of the White-bearded Honeyeater; in fact, I was of the opinion that the two were indistinguishable without seeing the birds at the nest. However, I recently read the following observations which offer a clue to correct identification.

"The nests and eggs of the White-bearded and White-cheeked Honeyeaters approximate closely, but Mr. E. H. Webb drew my attention some

years ago to an infallible method of distinguishing them if the birds are not present, which I have never seen printed. The nests of both species are lined with the red velvety material from the *Banksia* cones, but, while the White-bearded lines the sides of the nest, the White-cheeked species simply places a pad of lining material in the bottom."—Harrison, L., in *The Australian Naturalist*, Vol. II., pt. 2, April 7, 1910, p. 17.)

Nesting may take place throughout the year, though the main breeding season extends from July to December. The usual call-note is a double whistle—"E-chip," not unlike that of the Crescent Honeyeater, but less pronounced.

Bell-Miner. *Manorina melanophrys*.

The range of the Bell-Miner, or Bell-bird, within the County of Cumberland has become much restricted since the early years of settlement a century and a half ago. The species is represented among early bird paintings (circa, 1790) and about fifteen years later, George Caley, a collector of natural history (1800-1810) for Sir Joseph Banks, remarked:—"Dell-bird or Bell-bird. So-called by the colonists. It is an inhabitant of brushes, where its disagreeable noise (disagreeable at least to me) may be continually heard, but nowhere more so than on going up the harbour to Parramatta, when a little above the flats" (1827, p. 319). In 1898, A. J. North recorded the Bell-Miner as occurring at Pittwater and at the head of Narrabeen Lagoon (1898, p. 86). As far as I am aware it does not occur in those localities now. Settlement and the consequent destruction of forest areas, and disturbance caused by bush-fires, has driven the species further afield.

A small colony of Bell-Miners was observed on the west bank of the Nepean River, near Glenbrook Creek, in 1937, and again in 1938. Several Noisy Miners, or Soldier birds were present on one occasion. These two species have much in common, the same kind of flight and attitudes when searching for food, while some of their call-notes are similar. Another colony, of about twenty birds, was observed in the Menangle-Douglas Park district, close to the Nepean River, in 1939. Generally speaking, the birds favour tall, closely-growing forest with thick underscrub, in damp situations, near water. However, those seen at Menangle-Douglas Park were in an area of stringy-bark trees with an undergrowth of blackthorn shrubs; quite a dry spot.

The plumage is greenish, relieved by orange coloured legs and beak, and a patch of bare orange skin behind the eye. The birds are difficult to see among the outer foliage of the trees, despite the fact that they are constantly on the move and call continuously.

After camping in the midst of a colony of these birds I must confess to sentiments similar to those expressed by George Caley; if not actually disagreeable the persistent metallic tinkling notes of dozens of birds become somewhat monotonous. Like the bagpipes, the "silver-voiced Bell-birds" are heard to advantage in the distance.

Several Bell-Miners were seen about Coup Creek in the Thornleigh district by Mr. E. Nubling during March and April, 1941, but they do not appear to have settled in that locality. The species is common in the Avoca-Terrigal district, a little to the north of the county.

Soldier-bird. *Myzantha melanocephala*.

(Plate xiv.)

Soldier-birds, or Noisy Miners are common throughout the open forests and partly cleared lands of the shale areas of the county. They also frequent sandstone country generally near its junction with the shale, and where a somewhat mixed vegetation occurs. In true sandstone forests, within the county, they are rare.

On the Pittwater Peninsula (Newport, Avalon, Palm Beach), and adjacent localities (Narrabeen, Bayview), Soldier-birds are quite numerous. While the geological formation of these places is largely sandstone, the vegetation differs somewhat from the normal sandstone flora; this is because of the intrusion of the richer soils of the "Narrabeen," or chocolate shales, and the presence of alluvial flats.

The species is largely stationary; at least, that is my impression. A small colony near Chatswood is always to be found in a restricted area of shale forest thereabouts. Elsewhere in the county birds are present in numbers throughout the year. Possibly seasonal variations in food supply, or some other cause, may induce nomadic movements. P. A. Gilbert records (1935, p. 204) that this species visits coastal areas during the autumn and winter months.

They are gregarious and sociable to a degree, especially in the autumn and winter. A single bird will perch on an exposed branch and commence to chatter; it is soon joined by many of its friends, who add to the clamour. When they detect a stranger in their midst, such as an owl, a snake, a koala, or even a human, they make a great outcry—discordant notes that bring every Miner within hearing to the scene.

The early colonists of Sydney must have thought these birds a great nuisance. On an old painting of this species, drawn about 1790, is written: "This chattering bird often gives notice to the Kangaroos when sportsmen are after them. It is pretty numerous, and always at war with others of the feathered tribe" ("Watling" drawing, No. 96, 1906, p. 126).

August, September and October are the main nesting months, though some birds may nest earlier or later.

Soldier-birds have taken kindly to settlement and will become quite tame when fed on scraps, even venturing on to the verandah tables of bushland homes at meal times for their share of the food.

Red-wattle Bird. *Coleia carunculata*.

Thirty or forty years ago "Gill-bird" shooting was a popular, and often a profitable, sport in the neighbourhood of Sydney during the autumn and winter months. Thousands of birds were killed each season and many of them were hawked in the streets at 3/6 per dozen, or sold to poulterers and restaurants.

Shooters, after erecting a slanting pole in some favourite haunt of the birds, concealed themselves in a hide. The birds in moving from one place to another would settle on these poles and at times a dozen or more would be killed by a single shot. Even though the birds have been protected in the county for some twenty-five years they have not increased greatly in numbers. This may be due to the slaughter in the past; it is more likely,

however, that the destruction of habitats, by settlement and fire, has a strong bearing on the matter.

Numbers of "Gill-birds" come in to the coastal areas near Sydney from April to August, presumably from the highlands of the Blue Mountains to the west, where they breed commonly during the spring and summer. A few birds remain in the county after August; some of these nest with us and in this respect the following records are of interest:—Pair nesting at Harbord, 2 eggs, 14/9/1929 (R. Blacket); pair nesting at Roseville, young in nest, August, 1942 (R. Gates); pair nesting at Collaroy, young hatched, summer, 1942 (A. F. Basset Hull); building nest at Lindfield, 7/8/1943; feeding young, probably same pair, Lindfield, 30/9/1943 (E. J. Bryce).

The birds that visit us in the autumn and winter frequent coastal scrubs, the more vigorous heathlands, and forest country generally, to feed on the blossoms of the banksias and eucalypts, and on insects. They are adept at moving about among the outer foliage of trees in search of food. I have also seen them feeding on the flowering spikes of the grass-tree (*Xanthorrhoea*), a favourite food tree of many Honeyeaters.

The majority of the "Gill-birds" in the county seem to be concentrated in coastal areas. They are attracted to the shale forests when such trees as the Ironbarks (*Eucalyptus* spp.) are in blossom. They often move about in small flocks of a dozen to twenty birds, never flying any great distance, but from one patch of trees to another.

The usual call is a harsh croak; at other times a short, loud whistling note is uttered seven or eight times in quick succession.

The Red-wattle bird resembles the following species, the Brush Wattle-bird, but can be recognised by its larger size, the red fleshy wattles below the eyes, and a patch of yellow feathers on the belly.

Brush Wattle-bird. *Anthochaera chrysoptera*.

(Plate ix. (a)).

Wherever the coast banksia and the heath-leaved banksia grow one is almost certain to find this noisy and active bird. It is largely a resident species, though odd birds may wander from their favourite haunts—coastal scrubs and sandstone heaths. Recently (23/5/1942) I saw two Brush Wattle-birds perched on the wire supports of a tall flagpole in a closely settled part of Willoughby. They were uttering their raucous calls and seemed much out of place.

Nesting may take place throughout the year, though the main breeding season extends from August to January. In many instances only one young bird is reared, even when two eggs are laid to a sitting. A friend, Ralph Blacket, watched a pair of birds that nested in a tree near his home at Collaroy. The birds used the same nest three times in succession in the one season, the summer of 1940, with the following results:—(1) one egg, one young; (2) one egg, one young; (3) two eggs, one young.

The Brush Wattle-bird is not normally found in shale areas within the county, except, perhaps, near the junction of the shale with the sandstone, or in home gardens where the cover is thick and suitable food trees are growing. Interesting notes on the nesting of this species at Wahroonga were published some years ago (1927, p. 302) by the late Mr. H. Wolsten-

holme. Nests are usually built in shrubs or trees at no great height above the ground.

An appropriate name for the Brush Wattle-bird (it does not possess wattles) would be "Banksia bird" because of its close association with these typically Australian trees and shrubs.

The call-notes are varied but mostly hoarse and unmusical. A soft, throaty chuckling note is often uttered when the birds are at, or near, their nests. Quite frequently the head is pointed upwards and a clattering sound made with the bill.

Spiny-cheeked Honeyeater. *Acanthagenys rufogularis*.

The inclusion of this species is based on the occurrence of a single bird seen in the garden of Mr. Erwin Nubling at Normanhurst, near Hornsby. It was observed by Mr. Nubling several times during August, 1938 (8/10/13, and 16) seeking nectar from montbretia blossoms. At a later date, Mr. Nubling examined specimens of this Honeyeater, and he is certain of his identification. The bird seen had less rufous colouring on the throat and breast than adult birds, indicating that it was in immature plumage. There are specimens in the Australian Museum from Dorrigo and Kempsey (coastal N.S.W.). The species also occurs in coastal areas of Victoria. Normally, it has an inland distribution in New South Wales.

Noisy Friar-bird. *Tropidorhynchus corniculatus*.

The Noisy Friar-bird, or Leatherhead, inhabits the forest areas of the country. It appears to be more numerous in sandstone than in shale forests. Like many other Honeyeaters, it is nomadic and inclined to gregariousness in the autumn and winter. A few years ago, 1938, the swamp mahogany trees (*Eucalyptus robusta*) flowered profusely in coastal localities near Sydney, especially in the Mona Vale-Avalon district. Honeyeaters and Lorikeets were attracted in great numbers to this bountiful autumnal feast. Not the least apparent among the noisy assemblage of birds were many chattering and pugnacious Leatherheads.

In the non-breeding season they sometimes visit the heathlands to sip nectar from the flowering banksias. A loose flock of twenty or more birds will haunt a stand of white honeysuckle while the blossoms last. Favourite food trees in summer are the silky oak and the Moreton Bay chestnut.

Insects are eaten extensively. I once watched a pair of Leatherheads flying a hundred feet or so in the air to capture what seemed to be winged ants which were fed to their nestlings. The same habit has been recorded by Mr. Norman Chaffer (1933, p. 129).

The various names by which this species is known are derived either from its appearance or its call-notes. "Knob-fronted Bee-eater" (an early name) from the prominent knob or boss at the base of the upper mandible; "Leatherhead" and "Friar-bird," from the dull black bare flesh on the head and neck, having a fanciful resemblance to the cowl or hood of a friar. Such names as "Pimlico," "Four-O'clock" and "Poor Soldier," have originated from its chattering, querulous calls.

A. J. North records (1906, p. 169) that in January and February, 1902, a period of inland drought, Leatherheads were "unusually plentiful" near Sydney, and that large numbers were shot in orchards, where they were very destructive, eating all kinds of summer fruits.

The nest is a large well woven cup attached to a forked branch of a tree, generally among the outer foliage, from twenty to fifty feet or more above the ground. The normal breeding season extends from September to December, or January. The Leatherhead is one of the foster-parents of the Koel Cuckoo.

Little Friar-bird. *Microphilemon citreogularis*.

This species is a rare straggler to the county. There are no records of its occurrence before 1902. In that year specimens were collected at Kurnell (May), Smithfield (June), and Pittwater (July), and later recorded by A. J. North (1907, p. 341), who attributed the appearance of the birds to an inland drought. A specimen was collected by Mr. Athol D'Ombraïn at Pymble on February 17, 1919, while Mr. E. Nubling observed a bird in a flowering gum tree at Waterfall Creek, National Park, on October 14, 1923.

During the winter and spring of 1932 a small party of these birds inhabited a restricted area at Harbord, a little to the north of Sydney. They seem to have been attracted by flowering coral trees, and were last observed towards the end of September of that year (1933, p. 306).

My sincere thanks are accorded to many friends for permission to use field observations and photographs included in these notes.

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NEW SHARKS AND FISHES FROM WESTERN AUSTRALIA.

BY GILBERT P. WHITLEY, F.R.Z.S.

Family GALEIDAE.

Genus GALEOLAMNA Owen, 1853.

Subgenus GALEOLAMNOIDES Whitley, 1934.

GALEOLAMNA (GALEOLAMNOIDES) EBLIS, *sp. nov.*

(Fig. 1.)

Diagnosis.—A Western Australian species of Whaler Shark with a narrow interdorsal ridge present, though becoming obsolescent anteriorly and posteriorly so that it does not completely unite the two dorsal fins; the dark colour of upper part of head does not descend below level of eye just behind the eye, though it does so before the eye; pectoral, anal and caudal fins with dark or dusky tips; snout acutely rounded; usually 14 teeth (see description below) each side of symphysial tooth; head and body together greater than tail from middle of vent (as 521 : 429 in holotype or 747 : 662 in allotype); anal origin and end typically behind levels of those of second dorsal fin.

Description of Holotype Female.

Head.—Predorsal profile not gibbous. Eyes large, with nictitating membrane. Interorbital convex. Pupil of eye on level with anterior curve of mouth. Snout acutely rounded. Head 3.9 in total length. Preoral length equals width of mouth. No spiracle. Teeth of upper jaw subtriangular, slightly and concavely notched on outer edges and with the rather gibbous inner slopes not notched. They are all (including the small symphysial teeth) coarsely serrated almost to their acute tips. The tooth on each side of the symphysial one is triangular but not notably smaller than its outer neighbours. Teeth of lower jaw somewhat compressed and slightly curved backwards, each with erect central fang separated on each side by a notch from its shoulder, the base is much longer than the height in most of the teeth, or slightly longer in those towards the tiny symphysial teeth. Serrations, microscopic.

Dental formula: 14.1.14

14.1.14

Tongue rounded anteriorly, not notched below. Tongue and palate slightly rugose (but paratypes variable in these features). Last two gill-slits over pectoral fins. Nostrils about equidistant from mouth and tip of snout. Labial folds mere notches.

Body.—Rather robust. Lateral line conspicuous anteriorly. A narrow interdorsal ridge present but becoming obsolescent anteriorly and posteriorly (occupying 137 out of 230 mm. interdorsal space in the holotype). No keel on caudal peduncle. A caudal pit above and below. Shagreen very fine, close-set, denticles apparently tricarinate.

Measurements.—Following the symbols devised in my scheme of biometric measurements published in Proc. Linn. Soc. N.S. Wales lxviii, 1943, pp. 114-115, the dimensions of the new species are as follows, in millimetres:—

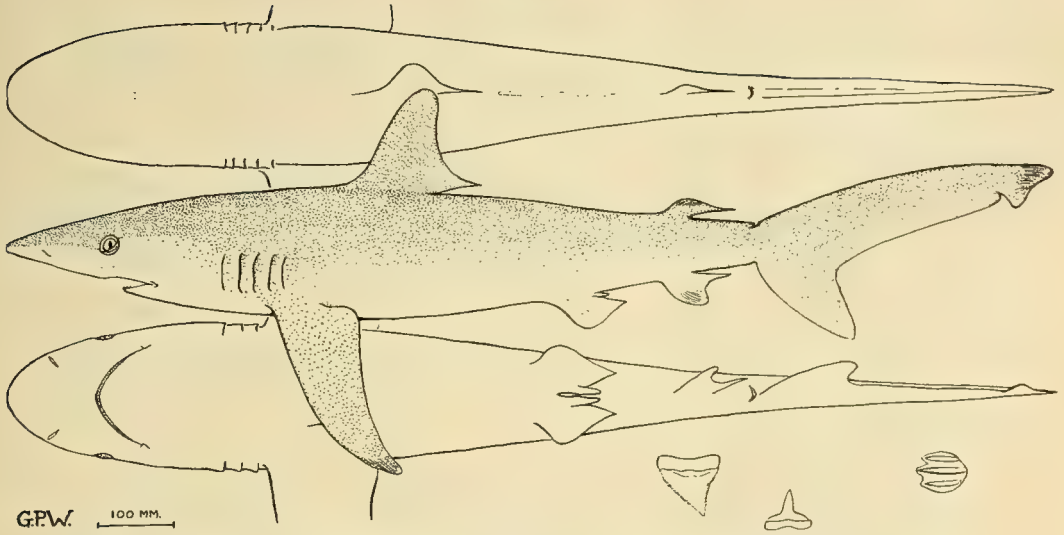


Fig. 1. Slender Whaler Shark, *Galeolamna (Galeolamnoides) eblis* Whitley. Dorsal, lateral, and ventral aspects; upper and lower jaw teeth, and a dermal denticle of the male allotype from Pelsart Island, Houtman's Abrolhos, Western Australia. —G. P. Whitley del.

	Holotype female.	Allotype male.		Holotype female.	Allotype male.
H.1	195	289	F.1	104	166
2	240	369	2	81	118
3	91	130	3	39	58
4	104	148	4	230	322
5	236	346	5	27	38
6	494	704	6	27	35
7	20	27	7	37	56
8	18	21	8	65	97
9	102	157	9	54	74
10	no spiracle		10	40	46
11	15	24	11	32	54
12	60.5	85	12	51	83
13	85	114	13	(vide descr.)	
14	85	124	14	158	283
15	6	9	15	50	80
16	6.5	9	16	277	397
17	29	47	17	46	67
18	24	45.5	18	45	59
B.1	696	988	19	28	44
2	521	747	20	115	179
3	321	467	21	253	388
4	C.120	181	22	105	167
5	190?	187			
6	35	50			
7	35	50			
8	—	37			
9	—	44			

Additional measurements are: Eye to first gill-opening, 95 mm. Tip of snout to outer angle of nostril, 54. Inner angle of nostril to mouth, 53. Ramal length, 62. Origin of first dorsal to that of pectoral, 137; to that of ventral, 208. Gill-slits: 29, 35, 35, 34, 24. Vent to end of tail, 429.

Fins.—Dorsal fins spineless, the first much larger than the second. Anal considerably larger than second dorsal. Anal origin and end of its base behind the levels of those of second dorsal fin. Pectoral axil well in advance of first dorsal fin but its last ray (pectoral angle) behind level of origin of first dorsal. Ventrals as usual in the family Galeidae. Sub-caudal notch high and small. Caudal edges trenchant; anterior edges of other fins not flattened. Lower caudal lobe rounded.

Colour.—Brownish-grey above, white below. A dusky grey tinge towards tips of fins. The vertical pupil black, iris pale pearly green with grey ring. Junction between dorsal grey and ventral white ground colours occurs at lower level of eye anteriorly to eye and at upper level of eye posteriorly to eye.

Described from the holotype, an immature female, 950 mm. in total length; weight, 10 lb.

Liver, pinkish, 9 oz. No ova, and uteri mere strips, in the holotype. Museum Regd. No.

Locality.—Off Bald Head, towards Breaksea Island, Western Australia; hooked on setline in about 20 fathoms, over rough ground, in morning, 30th September, 1943. Bait: Squid (*Sepioteuthis*) and Mullet (*Mugil*).

Other specimens referable to this new species are:—

- (1) A pair of jaws in the Fisheries Office, Geraldton, with dental formula 14.1.14 — 29. Specimen caught off Geraldton by Mr. H.

13.13 — 26.

J. Murray.

- (2) A specimen from Coventry Reef, off Garden Island, collected by W. B. Alexander in 1919. W.A. Mus., Regd. No. P.667. Female, 935 mm. total length. Head, 230; interdorsal, 230; upper caudal lobe, 240, approx.

Description of Allotype Male.

A male specimen of this new shark was caught at Pelsart Island in the Houtmans Abrolhos, Western Australia, on November 5, 1943. It agrees in general features with the holotype but the following characters are noteworthy, as indicating variation.

Head (369 mm.) 3.7 in total length (1.375 mm.). Snout fairly acutely rounded. Preoral length (114 mm.) less than width of mouth (124). Tooth on each side of symphysial one in upper jaw noticeably smaller than its outer neighbours. Dental formula 14.1.14.

14.1.14.

Teeth in one functional series with here and there a second row tooth risen. Three non-functional rows of teeth in upper and four to five in lower jaw, all these normally covered by gums. Nostrils slightly nearer mouth than tip of snout. Snout to endolymphatic openings, 171 mm. Predorsal profile gently convex, not gibbous. Widest part of shark (199 mm.) is at first gill-slits. Interdorsal ridge occupying 154 mm. of the inter-

dorsal space (322). Snout to vent (747 mm.) greater than length behind vent (622). Biometrics (see table).

Additional measurements (in mm.)		Holotype Female.	Allotype Male.
Eye to first gill-opening . . .		95	151
Tip of snout to outer angle of nostril		54	77
Inner angle of nostril to mouth		53	60
Ramal length		62	100
Origin of first dorsal to that of pectoral		137	251
Origin of first dorsal to that of ventral		208	309
Gill-slits I.-V.	29, 35, 35, 34, 24		47, 49, 49, 47, 45.5
Vent to end of tail	429		662

Colour brownish-grey above in life, becoming greyer after death. White below. The dark colour of the upper parts descends to lower level of eye anteriorly but only to upper level of eye posteriorly to eye. Tips of pectorals, second dorsal, anal and caudal fins dusky grey. Iris, pale yellow and greyish-brown, with grey outer ring. Liver, olive-brownish, weight 2 lb. 0 $\frac{3}{4}$ oz. Oil, sun-extracted. Vertebrae, 174.

There are about four carinae on the dermal denticles, extending to form spines along the margins.

There was a slight lateral curvature of the spine to the left below the first dorsal fin. Vertebrae 1 to 31 before first dorsal origin, 69 below second dorsal origin, 70 over anal origin, 87 below upper caudal pit and 174 to end of tail. Testis, 103 mm. long, immature. Stomach, empty.

Described and figured from the allotype, an immature male, 1,375 mm. or 4 ft. 7 in. in total length, weight 35 lb. Brain, teeth and dermal denticles preserved. (Museum Regd. No.....)

Affinities.—*Galeolamna eblis* is apparently a common sea shark in Western Australia as I have seen numerous carcasses of it in the Perth markets. Though sold indiscriminately as "Gummy," it may be distinguished from other butchered sharks in the markets by the interdorsal ridge being too short to unite the dorsal fins and by the second dorsal fin (even when cut off so that only a scar is left) being obviously very much smaller than the first.

Galeolamna greyi (Owen), seems more a river or estuarine species characterised by having larger, serrated triangular teeth in lower jaw, blunter snout, no interdorsal ridge, and deeper and rounder build than *G. eblis*, sp. n. The latter is most closely allied to *G. macrurus* (Ramsay & Ogilby) from New South Wales, but the incomplete interdorsal ridge is again diagnostic; it is always complete in *macrurus*.

GALEOLAMNA FOWLERI, sp. nov.

(Figs. 2, 2a.)

Two Whaler Sharks were obtained by Mr. S. Fowler in the Exmouth Gulf area in October, 1943. It was not possible to preserve the specimens, but photographs and a pair of jaws indicate that the species is an undescribed *Galeolamna*. The teeth of the upper jaw are more angularly

notched on both side and notably deflected outwards than in my (new) species from Albany and Pelsart Island and the dental formula is 13.1.13.

12.1.1.1.12.

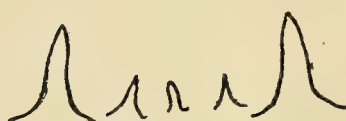


Fig. 2a. Teeth of holotype.
—G. P. Whitley del.

The upper jaw teeth are fairly coarsely serrated on base and finely serrated on cusp. Teeth of lower jaw erect, with tall fangs, not serrated, and without peg-like tops. The symphyseal teeth are small and acute in each jaw. There is a minute tooth on each side of the very slender symphyseal tooth of lower jaw; outside each minute tooth the lower jaw teeth are remarkably tall. Teeth in one functional series in upper, two in lower jaw, several

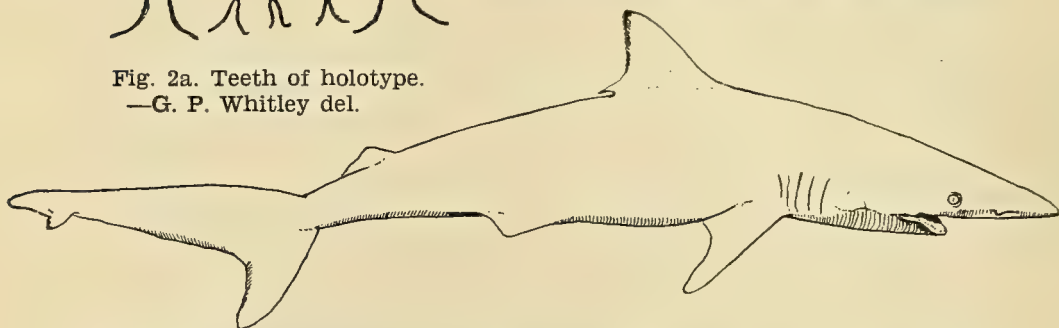


Fig. 2. Fowler's Whaler Shark, *Galeolamna fowleri* Whitley. Holotype from South Muiron Island, Exmouth Gulf, Western Australia.

—From photo. by S. Fowler.

rows behind these in gums. Mr. Fowler's photos show that this shark has a very long snout and small pectoral fins for the genus. However, the dentition alone is sufficiently distinctive, especially as regards the median teeth of lower jaw, to justify the proposal of a new name.

Holotype jaws in W.A. Museum, Regd. No. P.2503.

Locality.—South Muiron Island, off Exmouth Gulf; male, about 5½ ft. overall, hooked, 20th October, 1943. Two others caught inside Exmouth Gulf, Western Australia.

Obtained by and named after Mr. Stanley Fowler, Senior Research Officer, C.S.I.R., Division of Fisheries, who has made many flights over North-west Australia on a pioneering aerial survey of the fisheries resources there.

GALEOLAMNA DORSALIS, *sp. nov.*

(Fig. 3.)

Snout acutely rounded. Teeth small. Five gill-slits, the last two over pectoral fin. Body of elongate spindle-shape. Apparently no interdorsal ridge. First dorsal fin very large, its height greater than the depth of the body below it, its origin nearer pectorals than ventrals. Second dorsal and

anal fins rather large. Caudal and ventrals as usual in genus; pectorals long.

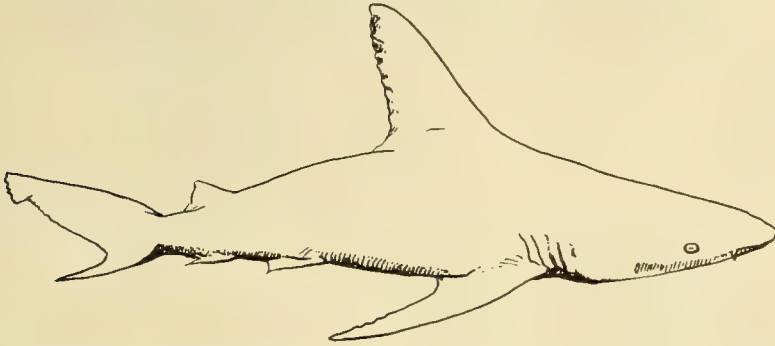


Fig. 3. Sand Shark, *Galeolamna dorsalis* Whitley. Holotype, Carnarvon, Western Australia.

Colour very light grey. No conspicuous dark marks on fins. Length up to about 5 ft.

Described from photographs of specimens caught off Carnarvon. W. Australia, in meshing nets by Marine Products of Australia, Ltd., in 1928, kindly made available by Mr. Alf. Melsom, who was a member of that firm. The species occurs along the N.W. Australian coastline, and was known as "Sand Shark" by the fishermen.

Distinguished from other species by the remarkably large and high first dorsal fin.

Genus LONGMANIA Whitley, 1939.

To this genus is referred a new species of Galeid sharks from Western Australia characterised by the small eyes; long, acute snout, with more than 15 teeth on either side of each jaw; oblique nostrils, without cirrhi; and lower caudal lobe conspicuously black-tipped. It differs from *L. brevipinna* (Muller and Henle, 1839) from the East Indies in having teeth minutely serrate in upper jaw, the lower caudal lobe black and labial folds long; the Queensland form of this species, illustrated in my "Fishes of Australia" (i., 1940, p. 107, fig. 107) also differs in similar respects; *Urangana nasuta* Whitley, 1943, from Queensland, has serrated teeth in upper jaw, but has plain lower caudal lobe. This genus has not hitherto been recognised from Western Australia.

LONGMANIA CALAMARIA, *sp. nov.*

(Fig. 4.)

Head very acutely pointed. Predorsal profile sloping, not gibbous. Nostrils entirely inferior, much nearer mouth than end of snout, oblique, simple with a small inner point but no cirrhi. No spiracles. Interorbital convex, subequal to snout. Pupil vertical, lenticular. Nictitating membrane thick. Eyes small, their anterior margins on level with middle of upper lip, their diameter more than length of nostril. Preoral length subequal to width of mouth. Labial folds slit-like, rather long for this family. Ampullae of Lorenzini and pit organs conspicuous. Second to third gill-slits longest. Palate and tongue rugose, tongue with concave notch

anteriorly. Rictus less than twice as broad as long. Teeth of upper jaw slightly compressed, with slender central fang with broad shouldered base, minutely serrate. No serrations are visible on lower jaw teeth, even under a lens. Small subtriangular symphyseal tooth in upper jaw with a small tooth on left side of it. Dental formula $17.1.17 = 35$. Lower jaw teeth

similar to upper but smaller,

$$16.1.16 = 33.$$

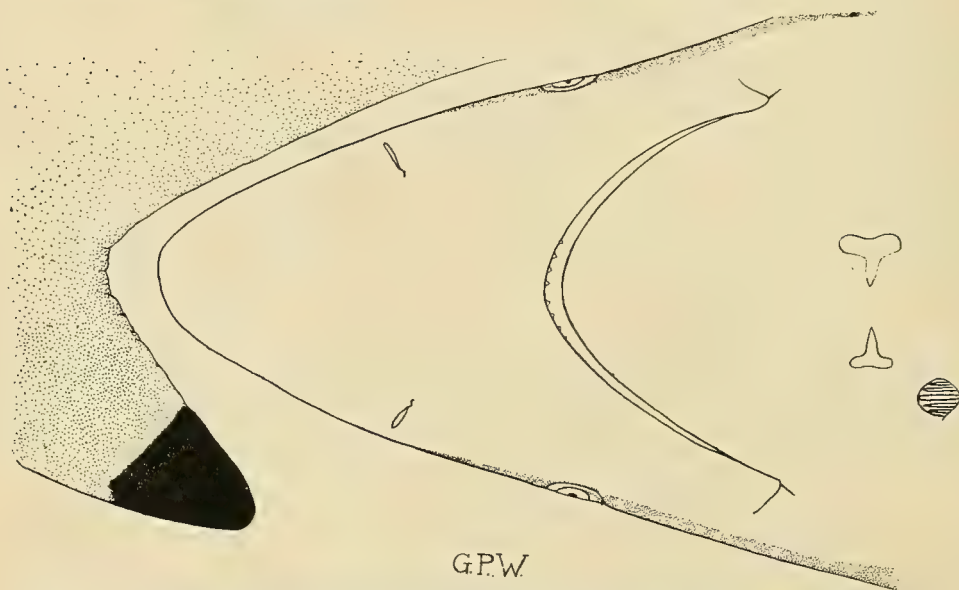


Fig. 4. Inkytail, *Longmania calamaria* Whitley. Holotype from Busselton, Western Australia. Left to right: caudal fork, ventral surface of head, upper and lower tooth, and dermal denticle.

—G. P. Whitley del.

curved backwards, with more slender and more widely spaced fangs; a small erect symphyseal tooth, with the tooth on either side of it smaller than their outer neighbours. Dermal denticles (from top of head), hard, shiny, imbricate, and with three to five keels, which barely cross to the more or less entire margin.

Dimensions in mm.

H.	1.	Snout to first gill-slit	366
	2.	Snout to fifth gill-slit	460?
	3.	Snout to anterior margin of eye	163
	4.	Breadth of snout immediately before eyes	152
	7.	Eye: horizontal diameter	20
	8.	Eye: vertical diameter	20
	9.	Interorbital	151
	11.	Length of nostril	16.5
	12.	Internarial	83
	13.	Preoral length	141

14.	Width of mouth	142
15.	Upper labial fold	15
16.	Lower labial fold	7
17.	Height of first gill-opening	174
—.	Eye to first gill-opening	190
—.	Snout to nostril	98
—.	Nostril to mouth	63
—.	Snout to level of corners of mouth	225
—.	Ramal length	107
B. 6.	Depth of caudal peduncle	78
7.	Breadth of caudal peduncle	65
F. 21.	Upper caudal lobe	453
22.	Lower caudal lobe	215

The holotype specimen consists only of a head and tail in the Western Australian Museum, Perth, consequently no description of the body and other fins can be supplied. However, the parts available are so characteristic that no hesitation is necessary to name this novelty. It is hoped that a complete specimen may one day be preserved and described in detail.

The caudal fin is of the usual Galeid type with a notch well along the upper lobe, whose tip is pointed. The lower lobe is rounded and (215 mm.) goes 2.1 in the upper (453). A deep caudal pit above and below.

Colour grey above, white below, the junction of these tones running along the lowermost level of the eye and visible from the ventral aspect. Eye bronze-greyish with a grey ring and bluish pupil. Upper edge and tip of caudal fin blackish; lower quarter of lower caudal lobe black.

Described and figured from the unique holotype, estimated to have been about 5½ ft. in total length. W.A. Museum, Regd. No. P.2526.

Locality.—Off Busselton, Western Australia. Caught on setline, by Messrs. Nicholas, Soulos and Victor Veale, 15th November, 1943.

I am indebted to Fisheries Inspector L. Smith, of Bunbury, for his enterprise in forwarding this remarkable specimen to Perth and for his interest in shark-catches and shark oils which has been of valuable assistance to me in my survey of the shark resources of Western Australia.

Family TRIAKIDAE.

FUR VENTRALIS Whitley, 1943.

(Fig. 5.)

Fur ventralis Whitley, Rec. S. Austr. Mus., vii., 4, November 30, 1943, p. 397. Off Bunbury, W.A. Holotype in W.A. Mus., Perth.

Drawings of the holotype of this new species from Western Australia were prepared, but unfortunately too late for inclusion in the Records of the South Australian Museum, so they are reproduced here.

Many more examples have been caught and examined, showing little variation save in the dental formula. One female measured 1,240 mm. long, with head 232 mm.; interdorsal, 330 mm.; upper caudal lobe, 222 mm.;

11.1.12
and dental formula ———

36.

Four males gave: Length, 1,308-1,335 mm.; head, 245-253 mm.; inter-



Fig. 5. Whiskery Shark, *Fur ventralis* Whitley. Holotype female from Bunbury, Western Australia. Lateral view, upper and lower teeth, upper and lower surfaces of head.

—G. P. Whitley del.

dorsal, 334-355 mm.; upper caudal lobe, 222-250 mm. Dental formula:

13.1.15	15.1.16
—	—
37	42.

Family *PLOTOSIDAE*.

TANDANUS BOSTOCKI, *sp. nov.*

Plotosus unicolor Castelnau, Proc. Zool. Acclim. Soc. Vict., ii., May 10. 1873, p. 141. Preocc. by *P. unicolor* Cuvier & Valenciennes, Hist. Nat. Poiss., xv., 1840, p. 426; ed. 2, p. 316.

Castelnau's species requires a new name. It was described as having been "found by Mr. Bostock in the small water-holes of the interior of Western Australia," but the "interior," in Bostock's time was probably not many miles from the coast. I re-name the species after the Rev. Bostock.

The W.A. Museum has specimens of this species from Serpentine which show that it is referable to *Tandanus*, having the ventral fins far forward of the caudo-dorsal fin and lacking the dendritic appendage on the vent.

The barbels are slightly shorter than the "barbs" mentioned by Castelnau, and the eye is one-third of the snout in the largest specimen (holotype of the new species), 370 mm. in total length (W.A. Mus. Regd. No. P.241), but this is due to growth, small ones being as described by Castelnau.

D.i., 6. A. about 68 + C.5 caudal, and approximately 50 caudo-dorsal rays visible posteriorly before being covered by adipose tissue anteriorly. Thus D. + C. + A. = about 123 minimum. P.i., 14. V.C., 14.

Length of head, 65 mm.; its height, 40, and width, 51. Depth below

first dorsal, 54. Eye, 9; snout, 28; interorbital, 24. Nasal barbels, about 24 (the left one bifid, abnormal). Maxillary barbel does not reach gill-opening.

Anterior nostrils opening forward over upper lip. Teeth peglike, white, in broader than long patches on intermaxillaries and mandibles and in a crescent on vomer. Gill-membranes meeting across isthmus. Gill-rakers short and slender, 14 on lower limb of first branchial arch, the posterior face of which has a crenulate margin and bears seven or eight soft processes.

Axillary pore minute. First dorsal behind head, its spine 33 mm. long, its longest (second) ray (44 mm.) less than depth of body. Pectoral spine, 32 mm., its longest (third) ray, 39. Dark greyish to brownish, rather marbled on fins.

From *Tandanus tandanus* (Mitchell), the West Australian species differs in being more elongate, with a great interspace between the first dorsal and the caudo-dorsal fin; West Australians records of *tandanus* are referable to this new form.

Family OPHICHTHYIDAE.

CALAMURAENA, *gen. nov.*

Orthotype, OPHICHTHYS CALAMUS Gunther, 1870.

Head short, broadly conical, body very elongate. Dorsal fin beginning above head, well in front of pectoral fin. Pectoral fin very small, rounded. Tail two-thirds of length, or twice the length of the body. Head small, one-fifth of distance between gill-opening and vent. Cleft of mouth one-fourth of length of head. Teeth small, in two series anteriorly, reduced to one series posteriorly. Vomerine teeth few, scattered.

The orthotype of the genus has been placed under *Cirrhomuraena* Kaup, 1856 (type, *C. chinensis* Kaup), from which it differs in proportions and teeth formulae. In that genus the dorsal fin begins above the gill-opening, the pectoral fin is long and narrow, the head long and elongate, the cleft of the mouth long, two-fifths the length of the head; the teeth small, of equal size, in double or triple series, forming broad bands.

CALAMURAENA CALAMUS (Gunther).

(Fig. 6.)

Ophichthys calamus Gunther, Cat. Fish. Brit. Mus., viii., 1870, p. 74. Fremantle, W.A. Type in British Museum.

No illustration of this species having been published, I now figure an example in the Western Australian Museum, Perth, from Claremont, Swan River, July, 1939, Regd. No. P.1959; it is a little more than two feet long (618 mm.) and has the following characters.

Head (38 mm.) 4.7 in distance between gill-opening and vent (171). Cleft of mouth (8.5) 4.4 in head. Eye (3) 1.6 in snout (5) which is equal to height of gill-opening; gill-openings 7 mm. apart. Tip of snout to origin on dorsal, 21; length of pectoral, 10; tail, 409; depth of body, 15 mm. Posterior nostril in bulge in upper lip below anterior part of eye. Eyes adnate to head, lower jaw just reaching nostril. Anterior nostrils large. Lower lip with spaced ciliae. Throat grooved. Tongue not free. Pores around eyes and chin, others at preopercular angle and along lateral line. Integument plicate, mucous. Small depressible cardiform teeth in a broad-

arrow formation, in 1 to 3 series along upper jaw and vomer. Similar teeth on dentaries separated by a symphysial gap. A few teeth in advance of mouth under snout.

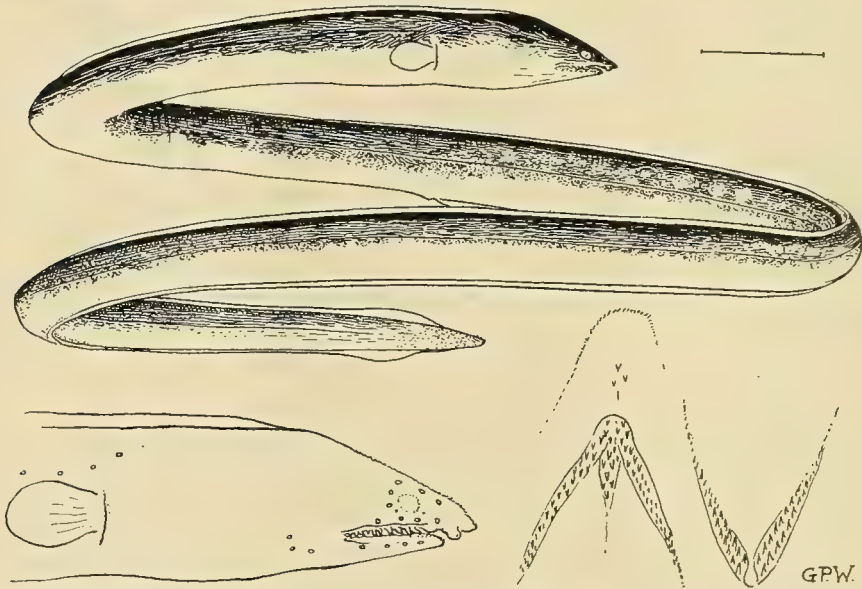


Fig. 6. Eel, *Calamuraena calamus* (Gunther). A specimen from Claremont, Swan River, Western Australia. Also head and dentition enlarged.

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Dorsal and anal fins in grooves for the most part, elevated before the end of the tail, whose tip is rounded and provided with small thorn-like asperities. Brown above, pale yellowish below, whitish from chin to vent, the junction of the dark and light areas below lateral line. Fins cream. Anal and dorsal infuscated posteriorly; some brown dots each side of anal towards end of tail.

Others characters as given by Gunther.

Family ECHELIDAE.

Genus *SCOLECENCHELYS* Ogilby, 1897.

SCOLECENCHELYS TASMANIENSIS SMITHI, *subsp. nov.*

Body anguilliform, the depth (5.5 mm.) 4.1 in the head (23). Head nearly 12 in total length (275) and 4.3 in the space between gill-opening and vent (100). Eye (2) 2.2 in snout (4.5) and 11.5 in head, less than interorbital (2.5). Cleft of mouth extending somewhat behind eye, its length (5) 4.6 in head. Anterior nostrils tube-like with small flap at orifice; posterior nostrils below anterior portion of eye. Teeth in single rows on jaws and along vomer. Pores around eye, on snout, along jaws, at preopercular angle and along lateral line. Gill-openings slightly less than eye. Jugostegalia present. Vent in anterior half of fish, its distance from snout (123 mm.) 1.2 in the tail (152).

Dorsal and anal fins low. Predorsal length (135 mm.) less than distance from dorsal origin to end of tail (140). Origin of dorsal to level of vent (20) less than head. About eight caudal rays.

Colour pale brownish yellow in formalin, the upper portions speckled with brown dots.

Described from the holotype of the subspecies, an eel nearly 11 inches long, from Quindalup, Geographe Bay, Western Australia; W.A. Museum., Regd. No. P.704.

A larger specimen, paratype of the subspecies, from Rottnest Island (W.A. Museum, Regd. No. P.1016), has depth (8 mm.) 3.6 in the head (29) which is 12 in total length (c.350) and 4.3 in space between gill-opening and vent (125). Eye (2.1) 2.3 in snout (5) and 13.8 in head; less than interorbital (3.5). Cleft of mouth (6) 4.8 in head. Snout to vent (154) 1.2 in length of tail (c.196). Predorsal length (c.180) more than distance from origin of dorsal to end of tail (170). Origin of dorsal to level of vent (19) much less than head.

This indicates, as might be expected, some variation in the position of the origin of the dorsal fin as the fish grows. The snout is relatively shorter than in the Tasmanian type of *Muraenichthys tasmaniensis* McCulloch (Biol. Res. Endeav., i., 1911, p. 19, fig. 5), and the gape of the mouth more extensive. These differences, in conjunction with the uniserial teeth induce me to provide a new name for the Western Australian subspecies.

Named in honour of Mr. L. Smith, for some time Fisheries Inspector at Bunbury, Western Australia, who has assisted me in field work on sharks and fishes.

Distinguished from other Australian *Muraenichthys* and *Scolecenchelys* as follows. From *breviceps*, *devisi*, *ogilbyi* and *godeffroyi* by having the dorsal fin originating behind instead of well before level of vent. *S. australis* has dorsal origin only slightly behind vent, *tasmaniensis* has already been compared, whilst *iredalei* has depth 3.5 in head, eye equal to interorbital and more rudimentary fins.

Family GALAXIIDAE.

GALAXIAS TRUTTACEUS HESPERIUS, *subsp. nov.*

D.10; A.13; P.15; V.7; C.16.

Head (29 mm.) 4.3, depth of body (23.5) 5.2 in standard length (125) or 5.2 and 6.1 respectively in total length. Eye, 6 mm.; snout, 8; interorbital, 12; depth of caudal peduncle; 11; width of body, 18.5; depth of head, 18; postorbital, 15; predorsal length, 89.

Profile not excavated over nape. Lower jaw slightly the longer. Maxillary extending to below anterior third of eye. Interorbital flat. Tubular anterior nostril higher than wide; posterior nostril a simple orifice between eye and three large mucous pores. Upper surface of snout with villiform processes. Curved teeth on jaws, tongue and entopterygoids. Ten short slender gill-rakers on lower limb of first gill-arch.

Form elongate, 55 myomeres to just before caudal base; 58 pores along lateral lines.

Dorsal fin with three simple and seven branched rays, its base (13 mm.) shorter than that of anal (16.5). Dorsal and anal, when laid back, not extending to caudal base. Height of anal fin (16) more than that of dorsal

(12). Origin on anal slightly behind that of dorsal (using Scott's formula—see remarks below—the value is 13.3). Posterior ten anal rays branched. Ventral fin 14 mm. long, not reaching the large vent. Ventral origin notably nearer base of caudal than tip of snout. Origin of anal to that of ventral, 27 mm. Pectoral rounded, 15 mm. long, extending much less than half the distance from its base to base of ventral (38). Caudal emarginate, with moderate procurrent ridges.

Colour, in formalin, dusky olivaceous above, dirty yellowish below; snout, opercles and fins dusky olivaceous, but not black-tipped. A vertical dusky bar, with light yellowish boundary behind it, over pectoral base. Back and sides with numerous round dusky spots, not ocellated, smaller than eye, in more than thirty transverse series, and most distinct behind level of ventrals, corresponding to colour-phase C. of Scott's classification (Proc. Roy. Soc. Tas., 1940 (1941), p. 65). A short diffuse dark oblique mark below eye.

Described from the holotype of the subspecies, a specimen 5.3/5th inches in total length.

Locality.—Creek flowing into Taylor's Inlet (Nannarup), Albany district, Western Australia; caught on line by Mr. Jackson about 10th December, 1943, and forwarded by Inspector J. E. Munro, of the State Fisheries Department. Holotype, W.A. Mus., Regd. No. P.2580.

The Australian Museum, Sydney, has two smaller specimens from the Albany district (No. I.13280) with vertical bars behind pectorals, about 15 transverse rows of spots on body and no dark tips to fins. Length, 2½ inches. These may be designated paratypes of the subspecies.

In Regan's key (Proc. Zool. Soc. London, 1905, ii. (1906), p. 365), the Nannarup specimen comes down to No. 17, *G. rostratus* Klunzinger, from the "Mersey River," i.e., Murray River, South Australia, but this is an instance of how a dichotomous key can mislead, not only as regards identification, but, as keys often do, as to the relationship of species. The key-characters relied upon by Regan have been shown, by later research, to be variable. *Galaxias rostratus* is slenderer than *truttaceus* with very different proportions, coloration, situation of ventrals, etc.

The Albany district specimens agree well with *Esox truttaceus* Cuvier (Règne Anim., ed. 1, ii., "1817" = December, 1816, p. 184), the type of the genus *Galaxias*, which came from Tasmania, and has been studied in detail in recent years by E. O. G. Scott. *Galaxias truttaceus* has been recorded from Tasmania, the islands of Bass Strait, Victoria, South Australia, and New Zealand, so that the Nannarup record greatly extends its range. However, it seems advisable to provide a distinctive name for the W.A. form as it differs from the Tasmanian type in fin-counts and inasmuch as the pectoral and anal fins do not extend back so far.

Using Scott's formula for expressing the relationship between dorsal and anal fins in another allied species, *Galaxias scopus*, from Bass Strait (Proc. Roy. Soc. Tas., 1935 (1936), pp. 98-99), the Nannarup specimen gives

$$\frac{A-D}{(d-D) + (a-A)} \times 100 = 13.3.$$

Where A = length from snout to origin of anal; a = length to end of anal base; D = length to origin of dorsal and d = length to end of dorsal base.

The 13.3 of the W.A. specimen compares with the 0 to 2 for *Galaxias scopus*, and 14.3 for *G. truttaceus*, but these differences seem to me less significant than the lengthening of the trunk, different fin-counts, and less conspicuous colour markings of the W.A. specimen in comparison with *G. scopus*.

Scott has also detailed (Proc. Roy. Soc. Tas., 1940 (1941), p. 66, table iii.), the variation of body- and fin-ratios in the three colour-phases of *G. truttaceus*. My Nannarup specimen resembles most closely his Figs. 13 and 14, and colour-phases Ca and Cb, but is much longer than his fishes and lacks their nuchal concavity. Some significant differences between his largest specimen and mine are as follows:—

	Scott's <i>maximum.</i>	Nannarup <i>type.</i>
Standard length	109.1 mm.	125 mm.
Head in standard length . . .	5.1 times	4.3 times
Eye in head	5.4 "	4.8 "
Eye in interorbital	2.5 "	2.0 "
Length of pectoral fin in pectoral-ventral interspace . .	2.1 "	2.5 "
Combined bases of dorsal and anal fins in standard length	4.9 "	4.2 "

There is less discrepancy in other ratios.

It is noteworthy that many south-western Australian fishes are much larger than their eastern Australian allies, and this *Galaxias* is another case in point.

The existence in Western Australia of a second species of *Galaxias* (*G. occidentalis* Ogilby, having long been known from that State) is of considerable zoogeographical interest, but whilst *G. occidentalis* lives in fresh water along the lower western coast, *G. truttaceus hesperius* comes from the southern coastline.

The Australian Museum, Sydney, has specimens of *Galaxias occidentalis* from Boyup, Tambellup, and Northcliffe. The W.A. Museum, Perth, has 86 specimens, 30 to 166 mm. in total length, from the following localities:—

Kalamunda (P.32); Whitby Falls (P.2088); Serpentine (P.244); Warperup River, Laurier (P.698); Narrogin (P.414); Karridale (P.1162); Maddington (P.825); Group 79, Manjimup (P.924); Tambellup (P.1014, 1015, 1063); West Swan River—infected with *Clonorchis* (P.1114, 1115); Cunderdin (P.1432); Tunney, via Cranbrook (P.1801 to 1803); Brook below swimming Pool, Pemberton (P.1529 to 1577; 49 specimens); Harvey River (P.1782, 1783, 1804 to 1806); Dead Man's Creek, South Porongorups (P.1787); Fremantle, from tank fed by water from Mundaring Supply (P.2179); no precise locality (old Nos. 36, 89, 567 and 568).

The two W.A. species may be separated thus:—

- A. Vertical bars along body. Caudal peduncle long and tapering. Origin of anal opposite that of dorsal. Ventral origin about half way between snout and base of tail. *G. occidentalis*.
- AA. Body spotted. Caudal peduncle short and deep. Origin of anal behind level of that of dorsal. Ventral origin nearer base of tail than snout. *G. truttaceus hesperius*.

The land and freshwater faunas of the Albany-Esperance portion of Western Australia are apparently of great antiquity, and are auto-

chthonous Australian animals. This area supports, for example, a frog, *Hyla cyclorhyncha*, which is not found in the remainder of the south-west, and seems to have affinities with Tasmania.

Family SYNGNATHIDAE.

Genus LISSOCAMPUS Waite & Hale, 1921.

LISSOCAMPUS AFFINIS, *sp. nov.*

D. 11; A. O.; P. 5; C. 9. Annuli, 12 and 46. Subdorsal annuli = last 2 body-rings.

Snout (2 mm.) 3.2 in head (6.5); eye (1) 2 in snout and 6.5 in head. Head 2.4 in trunk (16) or 13.0 in total length (85). Trunk nearly 4 in tail (63) which is 1.3 in total. Dorsal base nearly 3 mm.; caudal slightly longer than snout.

General characters as described for *caudalis* by Waite & Hale (Rec. S. Austr. Mus., i., 1921, p. 306, fig. 46), but dorsal base is longer than snout, the pectoral fin is reduced to about half the size of theirs, and I cannot trace any anal fin; the caudal fin is twice as long as the pectoral. The brood pouch is subcaudal, below the first ten tail rings.

The low number of caudal annuli (46 in this specimen, compared with 60 in *caudalis*) is noteworthy.

Described from a male specimen 3-1/3rd inches long; holotype of the species.

Locality.—Bathurst Point, Rottnest Island, Western Australia. W.A. Mus., Regd. No. P. 1150.

A paratype male (Austr. Mus., Regd. No. IB.341) was obtained by me in Shark's Bay in 1939.

Family ATHERINIDAE.

CRATEROCEPHALUS CUNEICEPS, *sp. nov.*

D. vi./8; A. i., 7; P. i., 12. Sc. 38. Tr. 9 or 10. Predorsal Sc. 10. Interdorsal Sc. 3 or 4.

Head (10 mm.) 3.6, depth (8.5) 4.2 in standard length (36). Eye, 3 mm.; interorbital, 3.6; snout, 2.8; depth of caudal peduncle, 3; length of pectoral, 7.

Form deep, compressed. Head flattened above, tapering down towards ventral profile; snout acutely pointed. Lower jaw the longer, mouth oblique, extensile, apparently toothless. Maxillary not reaching below eye. Rami of mandibles obliquely elevated. Premaxillary processes more than half eye-diameter. Head scaly, except before eyes. Ten short gill-rakers on lower limb of first gill-arch.

Body covered with large, entire, cycloid scales in 38 transverse rows between shoulder and hypural joint. Anus about three scales ahead of anal fin, situated between tips of adpressed ventrals.

No produced fin-spines. Origin of first dorsal slightly nearer snout than root of caudal. Anal base longer than that of dorsal, more than half its distance from caudal. Anal origin in advance of level of second dorsal origin. Third pectoral ray longest. Pectorals reaching above ventral base. Ventrals about opposite first dorsal origin. Caudal bilobed.

Colour in alcohol, straw-yellow, with a broad silver lateral band. Eye silvery. Fins whitish. Blackish chromatophores infusate top of head,

edges of dorsal scales, and extend along some fin-rays. A median dark streak from anal origin to just before lower caudal root along fifth scale-row. Dusky areas over brain and each eye.

Described from a specimen 45 mm. or 1-4/5th inches long, largest of a series of nine specimens, 20 to 36 mm. in standard length; W.A. Mus., Regd. Nos. P.1998 to 2005.

Locality.—Belele Station, via Meekatharra, Western Australia; presented by Mr. Alf Snell, Annean Station, Nannine, September, 1939.

Differs from *C. eyresii* (Steindachner), as described and figured by McCulloch and Waite, in having Sc. 38 instead of 31-33 and L.tr. 9 or 10 instead of 13-14, in being toothless, and in minor details of proportions. *C. pauciradiatus* (Gunther) has ventral and anal insertions further forward, fewer (less than 30) scales and teeth in jaws. From other species of *Craterocephalus*, the new form differs in fin and scale-counts and proportions.

Family EPINEPHELIDAE.

EPINEPHELUS HOMOSINENSIS, sp. nov.

Br. 7. D.xi., 17; A.iii., 8; P.18. L.lat., 60 to hypural. L.tr., 0/1/44 between first dorsal and anal spines, to 12/1/12 on caudal peduncle.

Head (98 mm.) nearly 2.4, depth (80) 2.9 in standard length (235). Eye (20) 4.9, snout (18) 5.4 in head. Interorbital, 14; snout to end of maxilla, 45; length of pectoral, 60 mm.

No rugosities, bony ridges, or mucous cavities on head. Head large, mostly naked or with only vestigial scales apparent on vertex and opercles. Eyes large, interorbital very slightly convex. Preopercular margin serrated, with two or three larger serrae at angle, all pointing backwards. Upper opercular spine obsolete. Lower jaw projecting. Maxillary roundly truncate, naked, with small supplemental bone. Tongue smooth, rounded.

An outer row of cardiform and an inner band of villiform teeth in each jaw. Enlarged cardiform teeth on each side of upper symphysis. A canine on each side of each jaw anteriorly; large teeth depressible; lateral teeth not enlarged. A V-shaped patch of coarse villiform teeth on vomer and a band of similar teeth along each palatine.

Anterior nostril with skinny flap, but no tentacle; posterior nostril an open oval orifice. Gill-rakers slender, not very long, not being longer than gill-fringes, about eleven, plus some rudiments anteriorly, on lower half of first branchial arch. Upper border of opercular flap feebly curved.

Body moderately compressed, deepest at level of gill-flaps.

Scales with ciliated margins cover most of the body, including the cleithrum, but become vestigial or absent on anterior half of back on each side of spinous dorsal fin and are reduced in size on the breast. Small scales extend on to all fins except ventrals. Scale-rows of body are horizontal or slightly ascending posteriorly, crossing course of lateral line. Base of spinous dorsal subequal to that of soft. Membranes of spinous fins pencilled. First spine originating over opercular flap. Fifth spine longest (33 mm.) but shorter than the longest (twelfth) ray (35). Last dorsal spine 29 mm. Second and third anal spines strong, subequal and shorter than longest anal ray (31).

Pectorals broadly rounded, ninth ray longest. Ventrals behind pectoral base, second ray longest, pointed, reaching vent, but shorter than pectorals. Caudal broadly rounded.

Colour, in life, extremely variable, from brick-red to greenish, with or without large cream spots on head and crossbars on body, and changing continually. A dark brown "moustache" mark along preorbital posteriorly. No saddle-shaped blotch over tail. No black margin to dorsal fin. No white spots or dots over body.

In formalin specimens the general colour is greyish-brown of various tones with five oblique brown cross-bars below dorsal fins and across caudal peduncle. Fins of darker greyish tone. Eyes blue. A dusky blotch on breast anteriorly. No dark longitudinal lines.

Described from the holotype of the species a specimen 235 mm. in standard length or nearly $11\frac{1}{2}$ inches overall.

Locality.—Geraldton, Western Australia.

W.A. Museum, Regd. No. P.2413 (holotype). Paratypes (P.2412 and 2430) measure 251 and 128 mm. in total length respectively. I have also seen numerous live and fresh specimens in the Geraldton-Abrolhos region, Western Australia, where the species is known as Chinaman Cod. It is excellent as food and need not be confused with the very different Chinaman Fish of Queensland (*Paradicichthys*).

The obsolescent superior opercular spine and the low number of body scale-rows (about 60 instead of the usual 100 or more) and the naked anterior half of the back alone separate this species from its congeners.

Family SCOMBRIDAE.

RASTRELLIGER SERVENTYI, sp. nov.

Br.6. D.viii. (+ ii. ?)/12 + 5 finlets. A.12 + 5; P.19. L.lat., c.120. L.tr., 10/1/30.

Head (66 mm.) 3.7, depth of body (68) 3.6 in length to end of middle caudal rays (245). Eye (15) 4.4, interorbital (20.5) 3.2 in head. Snout, 18.5 mm.; length of preorbital, 36; depth of preorbital, 10; snout to origin of pectoral, 68; to origin of first dorsal, 90; to origin of second dorsal, 149; to origin of ventral, 82; snout to vent, 146; depth at origin of first dorsal, 64; depth at vent, 58; length of pectoral along body, 36; depth of caudal peduncle, 8; interaxillary width, 35; base of pectoral, 11.5; maxillary, 37; mandible, 34 snout to preopercular margin, 63; height (chord) of first dorsal fin, 32; of second, 19; of anal, 20; upper caudal lobe, from fork, 43; lower caudal lobe, 39.

Eye with broad adipose lids, leaving middle third of eye exposed. Lower jaw the longer. Preorbital notch and maxilla below it reaching below hind margin of eye. Interorbital flat, bevelled over eyes. Teeth, if present, microscopic. Head naked except for some large scales on cheeks. Preopercular flap broadly rounded. Isthmus keel-like. Gill-rakers very long, extending into mouth, much longer than gill-fringes; 15/26 on first right branchial arch. They are flattened and feather-like, bearing numerous spines on their inner edges which form a fur-like strainer. Pseudo-branchiae present.

Body tuna-like, somewhat compressed, covered with imbricate, oblong (broader than long) scales with crenulated margins and edges. These are smaller above than below the lateral line and largest just below pectoral bases. The scale-rows are mostly horizontal or as nearly so as the contours allow. Scales on breast minute. A naked sheath each side of first dorsal fin and a median naked strip towards nape. Lateral line very slightly curved. Two ridges on each side of caudal stem.

First dorsal originating behind level of ventral origin, its spines weak, curved, the third longest (26 mm.), any spines behind the eighth concealed in a groove. Distance from eighth dorsal spine to origin of second dorsal, (33); from there to base of last finlet, 74 mm. Pectoral short, acutely rounded, situated in upper half of fish. Ventrals shorter than pectorals, less than half head. Anal origin behind level of that of second dorsal. Five finlets above and below. Caudal strongly forked. The anterior fins fit into grooves for streamlining.

Colour, after long preservation in formalin, largely faded to straw-yellowish, the eye bluish. A round dusky spot, much smaller than eye, is covered by the pectoral fin. Three or four dusky longitudinal stripes on sides below lateral line. Three or four pairs of brown spots on either side of first dorsal fin and a brown spot at origin of second. Extreme tip of first dorsal dusky.

Described from a specimen about 270 mm. or $10\frac{1}{2}$ inches in total length.

Locality.—Port Hedland, north-western Australia; coll. W. B. Alexander, 1914. W.A. Museum, Regd. No. P.18. New record for Western Australia.

Apparently closely allied to *R. canagurta* Cuvier (Règne Anim., ed. 2, ii., 1829, p. 197, as *Scomber*) from Vizagapatam, being similar to specimens described and figured as *Scomber microlepidotus* in Day's "Fishes of India," 1878, p. 250, pl. liv., figs. 3-5, but has fewer lateral line scales and pectoral rays, whilst the number of branchiostegal rays and gill-rakers are doubtless diagnostic also. Kishinouye's figures of *Rast(r)elliger chrysozonus* (Journ. Coll. Agric. Tokyo, viii., 3, 1923, p. 406, pl. xxxiv., fig. 63 and text-fig. W) show at least 140 scales in the lateral line and a comparatively smaller eye than in the Western Australian specimen.

"*Scomber*" *loo* and *moluccensis* differ, according to Gunther (Cat. Fish. Brit. Mus., ii., 1860, p. 360) in having fewer anal rays, with head and depth more than $4\frac{1}{4}$ in total length. In the north-western Australian specimen the head goes 4 and the depth 3.9 in total length. *Rastrelliger brachysoma* (Bleeker) has head $3\frac{3}{4}$ and depth little more than 3 in same.

Specimens of *Rastrelliger* are not common in Museums. The Australian Museum, Sydney, has examples of this genus from Trengganu, Malaya; Ongtong Java, the Philippines, Andamans, Madras, as well as Cape Bedford, Queensland, and Port Hedland, Western Australia, but they are not available to me at present. Mr. G. L. Kesteven obtained two *Rastrelliger* from Yeppoon, Queensland, on July 1, 1939, which are preserved at the C.S.I.R. Division of Fisheries, Cronulla, N.S. Wales. One was 162, the other 165 mm. long, and X-ray photos of them, lent to me by Dr. Serventy, show that both have 31 vertebrae (14 + 17). In Kishinouye's figure (*op. cit.*, fig. W), there are 13 + 18, whilst Gunther (Cat. Fish. Brit. Mus., ii., 1860, p. 360) gives 14 + 16 for "*Scomber kanagurta*."

The Queensland Museum has three *Rastrelliger* from Cape Cleveland, near Townsville, Queensland; February 25, 1938 (about 6 in. overall), May 26, 1939 (10 in.) and March 21, 1940 (5 in.). The exact racial or specific differentiation of these specimens must await further comparison. Mean-time, to afford a datum-line for future study, I name the north-west Australian form in honour of Dr. Dominic Louis Serventy, of the C.S.I.R., who has been engaged for some time in the study of Australian scombroid fishes.

Family SILLAGINIDAE.

SILLAGO FRASERI, *sp. nov.*

D.xi./20; A.ii., 18; L.lat., 66 to hypural joint + 3 to caudal root. L.tr., 6/1/11 below first dorsal, to 4/1/5 on caudal peduncle.

About 22 predorsal scales.

Head (27 mm.) 3.4, depth (16) 5.7, width (12) 7.7 in standard length (93). Eye (7) 3.8 in head. Snout, 10; interorbital, 5; length of pectoral, 17; depth of caudal peduncle, 8; the latter slightly less than postorbital portion of head, 10 mm. Length of caudal fork, 107; total length, 110 mm.

Upper profile of snout convex. Upper jaw the longer, not reaching back to level of nostrils. Interorbital not depressed, narrower than eye. Two to three rows of cheek-scales. Teeth villiform. Preopercle minutely crenulate. Scales of head cycloid, of body ctenoid with six radiae. A few vestigial scales behind dorsal rays.

General form of head and body and disposition of fins as usual in the family. No rays or spines produced, though the ventral fins are pointed. Dorsal fins separate. Base of second dorsal (31 mm.) much longer than that of anal (24). Ventral spine not expanded and originating before level of first dorsal's origin. Caudal emarginate, upper lobe the longer (17.5 mm.), subequal to pectoral.

Colour, yellowish above, white below. A narrow olivaceous axial streak. Top of snout, interorbital and opercles dusky grey; other parts of head and back infuscated. Some indistinct and diffused brownish-grey blotches, smaller than eye, along back, and a row of eight similar blotches, but more distinct, along sides from behind pectoral fin to middle of caudal peduncle. First dorsal fin with black dots along spines and on membranes adjacent to spines, but without a dark tip. Two or three rows of blotches of dark chromatophores slope downwards and backwards along membranes of second dorsal fin. Caudal infuscated, darkest on its base. No dark blotch on pectoral base. Pectorals, ventrals and anal mostly white, except for a tinge of yellow on ventrals. Eye bluish. Chin white.

Described from the holotype of the species, a specimen 93 mm. in standard length or 4.3 inches overall. W.A. Mus. Regd. No..... A smaller paratype is 68 mm. in standard length.

Locality.—Leschenault Inlet, Bunbury, Western Australia; 7th December, 1943, collected by Dr. D. L. Serventy.

Distinguished from its congeners by its colour-pattern, fin and scale-counts.

Though superficially like the Trumpeter Whiting, *S. burrus* Richardson, 1842, it can be distinguished from that species by its larger scales (66 instead of 70), by lacking a conspicuous blackish blotch on pectoral base and having the blotches on the body in a horizontal instead of an oblique direction, and in having fewer anal rays.

Named in honour of Mr. A. J. Fraser, the enterprising Chief Inspector of Fisheries and Game, Perth.

Family CALLIONYMIDAE.

Genus *CALLIURICHTHYS* Jordan & Fowler, 1903.*CALLIURICHTHYS GOODLADI*, *sp. nov.*

Diagnosis: A new south-western Australian dragonet with straight

preopercular spine (armed with spinules above and an antrorse barb below), interorbital concave, eight dorsal and seven anal rays, mostly simple, and eye about half length of snout.

Description: D.iv./8; A.7; P.18; V.i., 5; C.10.

Depth (15 mm) 8.7 in length to hypural joint (131). Head, to the posterior margin of the operculum (45) 2.9, and breadth before the pectorals (34) 3.8 in the same. Distance between the end of the snout and the tip of the preopercular spine (40) 3.2 in the standard length. Eye (9) 1.8 in snout (17) which is 2.6 in the head. Interorbital (3) 3 in eye; depth of caudal peduncle (8) less than eye.

Coarsely granular osseous rugosities on each side of cranium behind each eye. Gill-openings half-way between eye and ventral fin. Anterior margin of snout truncate (viewed from above). Upper lip projecting beyond the preorbital and overhanging the lower lip. Maxillary not reaching level of nostrils, which are small and situated before the small bony tubercle on the anterior orbital margin. Lower lip with a broad fold anteriorly. Preopercular spine curved slightly outwards but not upward at the tip. There are about a dozen small spinules on its inner edge and a strong antrorse barb on the outer surface of the base of the spine. Small teeth on jaws. Roof of mouth blackish.

Head and body depressed, sides rounded, caudal peduncle deeper than broad in the middle of its length. Lateral line of each side united across nape with branches extending forward to eyes and cheeks. Anal papilla small. Anterior dorsal spine slightly produced (32 mm. long) reaching near base of third dorsal ray, the three succeeding spines are progressively shorter, and are shorter than the anterior dorsal ray to which they are joined by membrane. Dorsal rays subequal in length and mostly simple, the last (eighth) is divided to its base and each branch is bifurcate; it reaches practically to above hypural joint. Anal of similar form to, but lower than, second dorsal, its origin and end behind levels of those of second dorsal. Upper margin of pectoral concavely excised, its median rays longest and most rays bifurcate. Ventrals broadly rounded, reaching vent, and with rays branched. Median caudal rays much longer than upper and lower ones, all but the outermost bifurcate.

Colour (in formalin), pale brownish-grey above, yellowish below. Eyes blue. Some small, sparse, grey flecks above head and body. About five diffuse grey blotches below the course of the lateral line. No ocelli, rings or pronounced bands or other markings. Top of head and snout, chin and viscera bluish. A brownish stain across branchiostegals below and a salmon-yellowish patch between pectorals on ventral surface. Fins pale yellowish. A black blotch mainly between tips of third and fourth dorsal spines. Some pale grey spots on second dorsal and others, more conspicuous, on upper portion of caudal fin. Anal and caudal margins smoky grey, without white borders.

Described from the holotype, a specimen 131 mm. in standard length or 7 inches overall. W. Aust. Mus. Regd. No., P.2528.

Locality.—Cheyne Beach, Albany district, Western Australia; seized by C. Westenberg, 20th July, 1943, and presented by Mr. James Goodlad, Fisheries Inspector at Albany, after whom I have much pleasure in naming the species.

Three paratypes, 117-126 mm. in total length, were taken from the

stomach of a tunny (*Kishinoella tonggol*) in Shark's Bay, Western Australia, on August 7, 1943, by Dr. D. L. Serventy and myself.

The affinities of this fish are nearest *C. nasutus* McCulloch (Biol. Res. Endeavour, v., 4, 1926, p. 197, pl. lii.), from Queensland, but it differs in having fewer dorsal and anal rays, smaller first dorsal fin, truncate and broader snout, more prominent upper lip, interorbital 3 instead of 5 in eye, etc. From other species of the genus it differs in the key characters given by McCulloch or as described above.

Family BLENNIIDAE.

VAUCLOSELLA CALVA, *sp. nov.*

D. iii., xiii./11; A. 21 or 22; P. 16; V. 2; C. 12. L. lat., 19 tubes and 19 tubeless scales. L. tr., 9/1/8, or 7/1/9 at second dorsal, to 6 across caudal peduncle.

Head (9 mm.) 4.1, depth (6) 6.1, length of caudal (6) 6.1 in total length (37). Eye (3) 3 in head and much longer than snout (2).

Interorbital very narrow. Upper jaw the longer. Teeth small, in bands. A bifurcate tentacle at anterior nostril and a simple one over eye.

Gill-membranes united across isthmus. Head, throat, breast as far back as each side of anterior anal rays, and nape to each side of first dorsal fin, naked; there are some mucous pores crossing vertex of head. Body-scales ctenoid. Lateral line extending to below end of second dorsal, thence another 19 more or less notched scales extend to caudal. An anal papilla.

First dorsal spine (3 mm.) slightly longer than second; the second dorsal fin is longer and higher than the third. No produced rays or spines. Anal lower and longer than the second or third dorsals. Tenth pectoral ray longest, more than its distance from the snout, rays above it branched, but it and the lower rays are finger-like. Inner ventral ray the longer. Caudal rounded.

Colour, in alcohol, yellowish with spaced brown chromatophores on parts of opercles, lower half of pectorals, dorsals and anal, and scattered along back and flanks, snout and chin. Some large silvery flecks alternate with about ten dark blotches along sides below lateral line. Eyes bluish. Head mostly light in tone.

Described from the holotype, the smaller of two specimens, 37 to 39 mm. (up to $1\frac{1}{2}$ inches) in total length. Holotype and paratype, W.A. Museum Regd. No., P.1052.

Locality.—Cottesloe, Western Australia; on reef near jetty; coll. Mr. L. Glauert, September, 1929.

Similar to *Tripterygion rufopileum* Waite (Rec. Austr. Mus., v., 1904, p. 182, pl. xxiv., fig. 4, from Lord Howe Island), but with more than 20 anal rays and more than 3 rows of scales above lateral line, eye much more than snout, and slenderer body.

Family ANTENNARIIDAE.

Genus ECHINOPHRYNE McCulloch & Waite, 1918.

ECHINOPHRYNE GLAUERTI, *sp. nov.*

D. i/i/16; A. 8; P. 11; V. 5; C. 9.

Eye very small. Maxillary naked posteriorly, reaching below eye.

Mouth nearly vertical, with depressible cardiform teeth in several rows anteriorly and one or two rows at sides. Similar teeth on vomer and palatines, and some on sides of tongue. Nostrils superolateral, the anterior with skinny margin.

Depth (70 mm.) 1.8 in length to hypural joint (131); head, to end of operculum (43) 3 in same; eye (4) 3 in snout (12); first dorsal spine (17) 2.5 in head.

Gill-openings large pores before angle of pectoral fins. Pseudobranchium large and mobile. Body deep, compressed, the back grotesquely bulbous. Integument granular, like coarse velvet, not smooth, and lacking cutaneous appendages. Lateral line conspicuous anteriorly as a strongly arched chain of pores, curving down to lower half of caudal peduncle. Similar pores extend from before eye to shoulder, from mandible around preoperculum, with a branch towards pseudobranchium. First dorsal spine long, slender, and tapering, with a simple pennon-like illicium. Second and third spines enveloped in knobs of integument, which also nearly covers the rays of the long, low, soft dorsal. Second dorsal spine shorter than first and less than half length of third. Posterior dorsal and anal rays and most caudal rays branched. Margins of fins rounded. Anal fin originating below posterior half of soft dorsal fin. Dorsal and anal fins free from the short rounded caudal. Anterior pectoral rays longer than posterior. Ventrals small.

Colour.—General colour, soon after death (from a painting made by Mr. G. Pitt Morrison), light heliotrope grey (Ridgeway's Colour Standard) on head, body and fins. Some brown tinges on pectoral and ventral rays, across caudal near its base and tip, and in pectoral axil. A scarlet band across proximal parts of caudal rays and a splash of scarlet over anterior part of pectoral axil. Several large oval black ocelli, edged with white, on head and body: one each side of hump of third dorsal spine, three along base of soft dorsal, one on opercle, another over pectoral angle, one below middle of each side of body, three each side of belly, one each side of chin, others on pectoral base and a few dark flecks on the fins, which had apparently thin whitish margins. Tongue whitish with some dark marbling. First dorsal spine yellowish. No white patch on interorbital space or along back. No dark submarginal band on fins.

Described from the holotype, a specimen 131 mm. in standard length, or nearly 6½ inches overall. Western Australian Museum Regd. No., P.1459.

Locality.—Cottesloe Beach, Western Australia; washed up alive, 23rd July, 1935. Collected by the Misses B. and U. Glauert. A smaller paratype (No. P.1232) was found at Cottesloe in June, 1932, by Mr. L. Glauert. It is 60 mm. in standard length or nearly 3 inches overall.

Distinguished as follows from the only other species in the genus:—

- A. Eye larger, 1.2 to 1.5 in snout. Mouth oblique. First dorsal spine thick and spiny. Dorsal and anal rays simple. Skin covered with upstanding prickles, bifurcate or trifurcate spines. Body without conspicuous dark ocelli. South Australia and Victoria. . *E. crassisipina*.
- AA. Eye very small, 3 in snout. Mouth almost vertical. First dorsal spine slender and smooth. Some dorsal and anal rays branched. Skin a granular mat of blunter spicules. Body with conspicuous dark ocelli. Western Australia. *E. glauerti*, sp. nov.

OVERLOOKED BIRD PAPERS.

An Annotated List.

By

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and

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It is possible that very few workers in Australian ornithology are aware of the wealth of information concerning our birds to be found in the pages of the various agricultural journals of the Australian States; indeed, reference to them is consistently absent, although the contributors include such well-known names as A. J. North, Robt. Hall, Launcelot Harrison and others. These papers on varied, if largely economic, aspects of bird study, form no unimportant part of Australian ornithological literature, and it is with the object of indicating their scope, and making reference to them readily accessible that this annotated bibliography has been prepared. Many species of Australian birds are figured in colour and in black and white; some of the illustrations are certainly of doubtful merit, but their existence is worthy of record.

Numerous bird notes and plates are contained also in books published by the State Departments of Agriculture under titles which indicate nothing of their presence. What student of bird life would even suspect that *A Handbook of the Destructive Insects of Victoria* contained scores of coloured plates of avian destroyers of insect pests? Or, among the miscellaneous writings, that a paper with the uncompromising title of "The Sheep Fluke" includes a detailed study of the life and habits of the Magpie Lark—one of the finest bird studies yet produced in this country?

This contribution had its inception in a paper prepared by Mr. K. A. Hindwood on North's series, "The Insectivorous Birds of New South Wales," in *The Agricultural Gazette of New South Wales*, but it was then considered advisable to extend its scope to include all such contributions in this and similar publications—this joint list is the result.

Scientific names quoted are as printed in the various publications.

NEW SOUTH WALES.

THE AGRICULTURAL GAZETTE OF NEW SOUTH WALES.

CLELAND, J. B. (1878—), Principal Microbiologist to Department of Public Health, Sydney, 1913-1919; Professor of Pathology, University of Adelaide, since 1919.

1916. The Stomach Contents of Australian Birds.—xxvii., 4, April 3, pp. 263-269. [Reprinted as portion of *Dept. Agric. N.S.W. Science Bulletin*, No. 15, July, 1918. The Food of Australian Birds. An Investigation into the Character of the Stomach and Crop Contents, by Cleland, J. B., Maiden, J. H., Froggatt, W. W., Ferguson, E. W., and Musson, C. T. (*q.v.*).]

* Contribution from the Australian Museum, Sydney.

- COBB, N. A., Former Pathologist, Dept. Agric. N.S.W. Portrait in *Agric. Gaz. N.S.W.*, vii., 1, January, 1901, opposite p. 222.
1896. The Common Crow.—vii., 9, September, pp. 565-578. [A eulogistic and very biased account of the crow, largely based on American work, but containing original observations and notes on food by the author.]
1897. The Sheep Fluke.—viii., 7, July, pp. 453-481, pl. and text-figs. [Pp. 470-480 contain a detailed account of the Magpie-lark (*Grallina australis*) [*G. cyanoleuca*], its habits, food, and behaviour, together with musical notations of calls, etc. Extracts from Gould's *Birds of Australia* (misquoted as "Gray's *Birds of Australia*") on the Magpie-lark and the White-fronted Heron are included. The black and white plate by E. M. Grosse was compiled from some thirty photographs. E. M. Grosse was an artist on the staff of the Dept. Agric., N.S.W.; his portrait appears in *Agric. Gaz. N.S.W.*, xii., 1, January, 1901, opposite p. 222.]
1904. The Sheep Fluke.—xv., 7, July 2, pp. 658-669. [Pp. 658-659. Ducks as destroyers of fluke snails. Continuation of the above paper.]
- FARRER, W. (1845-1906), Wheat Experimentalist, Dept. Agric., N.S.W. A famous wheat-breeder. Portrait in *Agric. Gaz. N.S.W.*, xii., 1, January, 1901, opposite p. 131.
1897. The Too Common Crow.—viii., 1, January, pp. 47-52. [A reasoned reply to N. A. Cobb's paper—1896 (*supra*). Notes on food, etc.]
- FROGGATT, W. W. (1858-1937), Government Entomologist, Department Agriculture, N.S.W., 1896-1923. Entomologist, Forestry Commission of N.S.W., 1923-1927. Portrait, *Agric. Gaz. N.S.W.*, xii., 1, January, 1901, opposite p. 131.
1900. Insects and Birds.—xi., 6, June, pp. 436-446. [The value of birds as destroyers of injurious insects.]
1904. The Willie Wagtail.—xv., 1, January, pp. 20-23, pl. and 3 text-figs. [A popular account. Black and white plate by H. S. Burton. H. S. Burton was an artist on the staff of the Dept. Agric., N.S.W.; his portrait appears in *Agric. Gaz. N.S.W.*, xii., 1, January, 1901, opposite p. 222. Paper reprinted as *Misc. Publ.*, No. 700.]
- The Australian Opossum. A Nature Study.—xv., October 3, pp. 932-935, 2 pls. [Includes a note on *Climacteris scandens* pulling fur from opossum. Figure of bird on plate is by E. M. Grosse. Paper re-issued as *Misc. Publication*, No. 796.]
1909. Several Aspects of the Protection of our Native Birds.—xx., 5, May 3, pp. 369-376. [A general account of the importance of bird protection.]
1912. The Starling. A Study in Agricultural Zoology.—xxiii., 7, July 2, pp. 610-616. [Plate (photo) in xxiv., 2, February 2, 1913, opposite p. 152.]
- Birds and Prickly Pear.—xxiii., 11, November 2, pp. 943-944. [The role of the Emu and other native birds as distributing agents in the spread of prickly pear.]
1914. Insectivorous Birds of New South Wales.—xxv., 4, April 2, 1914, to pp. 291-292, 2 pls. (col.). [37, Silver-eye; 38, White-winged

1915. Chough.]—xxv., 5, May 2, 1914, pp. 387-388, 2 pls. (col.). [39, Pheasant Coucal; 40, Bronze Cuckoo.]—xxv., 9, September 2, 1914, pp. 791-792, 2 pls. (col.). [41, Mallee Fowl; 42, Brush Turkey.]—xxv., 10, October 2, 1914, pp. 873-874, 2 pls. (col.). [43, Black Cockatoo; 44, Black-breasted Plover.]—xxv., 11, November 2, 1914, pp. 969-970, 2 pls. (col.). [45, Stone Plover; 46, Spur-winged Plover.]—xxv., 12, December 2, 1914, pp. 1051-1052, 2 pls. (col.). [47, Nankeen Night Heron; 48, White-fronted Heron.]—xxvi., 3, March 2, 1915, pp. 244-247, 2 pls. (col.). [49, Straw-necked Ibis; 50, Australian Bustard.]—xxvi., 4, April 1, 1915, pp. 334-336, 2 pls. (col.). [51, Bee-eater; 52, Masked Wood Swallow.]—xxvi., 6, June 2, 1915, pp. 519-520, 2 pls. (col.). [52, Yellow-rumped Tit; 54, White-fronted Chat.]—xxvi., 7, July 2, 1915, pp. 599-602, 2 pls. (col.). [55, Lyre Bird; 56, Nankeen Kestrel.]—xxvi., 9, September 2, 1915, pp. 765-766, 2 pls. (col.). [57, Delicate Owl; 58, Boobook Owl.]—xxvi., 10, October 2, 1915, pp. 865-870, 2 pls. (col.). [59, Pacific Gull; 60, Crow.]

[This is the continuation of the series, "Insectivorous Birds of New South Wales," by J. E. O'Grady.—*q.v.* for details.]

HARRISON, Launcelot (1880-1928), Challis Professor of Zoology, University of Sydney.

1909. Some further Aspects of Bird Protection.—xx., 10, October 2, pp. 863-868.

KINGHORN, J. R. (1891—), Ornithologist and Herpetologist, Australian Museum.

1924. The Value of Birds to Man. Especially in Relation to Agriculture.—xxxv., 1, January 1, pp. 45-48. [A general account; gives details of food of Quail and Barn Owl.]
1932. Wild Ducks are Not a Serious Pest of Rice Crops.—xliii., 8, August 1, pp. 603-608. [Investigation of alleged destruction by ducks of rice crops on the Murrumbidgee Irrigation Areas.]
1933. The Starling. Its Distribution and Suggestions for Control.—xliv., 7, July 1, pp. 512-515, map and text-fig. [Report on an investigation of the Starling in New South Wales.]
1937. Bird Life not Endangered by Grasshopper Poisoning.—xlviii., 1, January 1, pp. 15-16. [Unsigned, but quotes extensively from J. R. Kinghorn's report.]

LANSDOWNE, A.

1905. The Magpie.—xvi., 12, December 2, p. 1179. [Note on food, etc.]

MITCHELL, A. J.

1907. Sparrows.—xviii., 10, October 2, pp. 814-815.

MUSSON, C. T. (1856-1928), Lecturer in Botany and Entomology, Hawkesbury Agricultural College, N.S.W. Portrait in *Agric. Gaz. N.S.W.*, xii., 1, January, 1901, opposite p. 157.

1905. The "Sparrow Circular." Preliminary Observations on Reports Received at Hawkesbury Agricultural College.—xvi., 4, April 1, pp. 378-380.

- . Fruit-eating Birds. Preliminary Note on replies to the Circulars lately issued.—xvi., 6, June 2, pp. 587-590.
- 1907. The House Sparrow in New South Wales.—xviii., 6, June 3, pp. 535-538, map showing distribution;—xviii., 12, December 2, pp. 914-917. [Reprinted in *Misc. Publication*, No. 1094 (1908).]
- 1908. The House Sparrow in New South Wales.—xix., 2, February 3, pp. 127-135. [Reprinted as *Misc. Publication*, No. 1094 (1908), The House Sparrow in New South Wales, by C. T. Musson, pp. 1-17, map.]
- . A Native Bird Destroying the Sparrow.—xix., 8, August 3, p. 680. [*Pteropodocys phasianella* reported to be preying on Sparrows. Reprinted in *Qld. Agric. Journ.*, xxi., 1908.]
- 1909. Birds and the Orchard.—xx., 8, August 2, pp. 730-732. [Notes on the Economic Value of fifteen species of Birds found in the Hawkesbury Agricultural College orchard.]

NORTH, A. J. (1855-1917), Ornithologist, Australian Museum, Sydney.

- 1896 A List of the Insectivorous Birds of New South Wales.—vii., 6, to June, pp. 380-397, 10 pls. (8 coloured and 2 black and white) by
- 1905. H. S. Burton. [1, *Aegotheles novae-hollandiae*; 2, *Eurystopus albigularis* (fig.); 3, *E. guttatus*; 4, *Chaetura caudacuta*; 5, *Cypselus pacificus*; 6, *Hirundo neoxena*; 7, *Lagenoplastes ariel*; 8, *Petrochelidon nigricans*; 9, *Chaeramoeca leucosternum*; 10, *Merops ornatus* (fig.); 11, *Eurystomus pacificus*; 12, *Artamus sordidus* (fig.); 13, *A. superciliosus*; 14, *A. personatus*; 15, *A. leucogaster*; 16, *A. melanops*; 17, *A. albiventris*; 18, *A. minor*; 19, *Pardalotus punctatus* (fig.); 20, *P. melanocephalus*; 21, *P. affinis*; 22, *P. ornatus* (fig.); 23, *P. rubricatus*; 24, *P. xanthopygius*; 25, *Gymnorhina tibicen* (fig.); 26, *G. leuconota*; 27, *Grallina picata* (fig.); 28, *Pteropodocys phasianella*; 29, *Edoliisoma tenuirostre*; 30, *Lalage leucomelaena*; 31, *L. tricolor*; 32, *Pachycephala gutturalis* (fig.); 33, *P. rufiventris*; 34, *P. olivacea*; 35, *P. gilberti*; 36, *Collyriocincla harmonica* (fig.); 37, *C. rufigaster*; 38, *Falcunculus frontatus* (fig.); 39, *Oreoica cristata* (fig.); 40, *Sphenostoma cristata*; 41, *Psophodes crepitans* (fig.); 42, *Sphenura brachyptera* (fig.); 43, *Rhipidura albiscapa*; 44, *R. rufifrons*; 45, *Sauloprocta motacilloides* (fig.); 46, *Seisura inquieta* (fig.); 47, *Myiagra rubecula*; 48, *M. nitida*; 49, *Micraeca fascians* (fig.); 50, *Monarcha melanopsis* (fig.); 51, *Piezorhynchus gouldi*; 52, *Gerygone albigularis*; 53, *G. fusca*; 54, *Smicrornis brevirostris*; 55, *Erythrodryas rosea*; 56, *Petroeca leggii*; 57, *P. phoenicea*; 58, *P. goodenovii*; 59, *Melanodryas bicolor* (fig.); 60, *M. picata*; 61, *Drymodes brunneopygia*; 62, *Eopsaltria australis* (fig.); 63, *Poecilodryas capito*.]—Part II.—viii., 1, January, 1897, pp. 25-37, 4 pls. (col.), xi.-xiv., by H. S. Burton. [64, *Malurus cyaneus* (fig.); 65, *M. lamberti*; 66, *M. melanotus*; 67, *M. leucopterus*; 68, *M. leuconotus*; 69, *M. callainus*; 70, *M. melanocephalus* (fig.); 71, *Menura superba*; 72, *M. alberti*; 73, *Amytis striatus*; 74, *A. textilis*; 75, *Stipiturus malacurus*; 76, *Hylacola pyrrhopygia*; 77, *Atrichia rufescens*; 78, *Pycnophilus floccosus*; 79, *Cisticola exilis*; 80, *Sericornis citreogularis*; 81, *S. magnirostris*; 82, *S. frontalis*; 83, *S. maculatus*; 84, *Pyrrholaemus*

brunnea; 85, *Acanthiza pusilla*; 86, *A. lineata*; 87, *A. nana* (fig.); 88, *A. uropygialis*; 89, *Geobasileus chrysorrhoa* (fig.); 90, *G. reguloides*; 91, *Ephthianura albifrons* (fig.); 92, *E. aurifrons* (fig.); 93, *E. tricolor*; 94, *Origma rubricata*; 95, *Xerophila leucopsis*; 96, *Chthonicola sagittata*; 97, *Anthus australis* (fig.); 98, *Cinchorhamphus cruralis*; 99, *C. rufescens*; 100, *Mirafra horsfieldii* (fig.); 101, *Megalurus galactotes*; 102, *M. gramineus*; 103, *Acrocephalus australis*.]—Part III., xi., 1, January, 1900, pp. 1-2, 1 pl. (col.), by H. S. Burton. [104, *Struthidea cinerea* (fig.); 105, *Pomatostomus temporalis* (fig.); 106, *P. superciliosus*; 107, *P. ruficeps*.]—Part IV., xiii., 2, February, 1902, pp. 183-186, 1 pl. (col.). [108, *Climacteris picumnus*; 109, *C. erythropis*; 110, *C. superciliosa*; 111, *C. scandens*; 112, *Sittella chrysoptera*; 113, *S. pileata*; 114, *Cuculus pallidus*; 115, *Cacomantis flabelliformis* (fig.); 116, *C. variolosus*.]—Part V., xiii., 4, April, 1902, pp. 407-408, pl. xvii. (col.). [117, *Mesocallus palliolatus*; 118, *Lamprococcyx plagosus* (fig.); 119, *L. basalis*.]—Part VI., xvi., 10, October 2, 1905, pp. 1011-1021 (conclusion). [120, *Podargus strigoides*; 121, *P. plumiferus*; 122, *Dacelo gigas*; 123, *Halcyon sanctus*; 124, *H. pyrrhopygius*; 125, *H. macleayi*; 126, *Cinclosoma punctatum*; 127, *C. castaneonotum*; 128, *Geocichla lunulata*; 129, *Leucosarcia picata*; 130, *Eupodotis australis*; 131, *Oedicnemus grillarius*; 132, *Lobivanellus lobatus*; 133, *Sarciophorus pectoralis*; 134, *Strepera graculina*; 135, *S. cuneicaudata*; 136, *Graucalus melanops*; 137, *G. mentalis*; 138, *Corcorax melanorhamphus*; 139, *Corone australis*; 140, *Corvus coronoides*; 141, *Oriolus sagittatus*; 142, *Ptilinorhynchus violaceus*; 143, *Chlamydodera maculata*; 144, *Sericulus melinus*; 145, *Sphecotheres maxillaris*; 146, *Ptilotis lewinii*; 147, *P. chrysops*; 148, *P. fusca*; 149, *Myzantha garrula*; 150, *Meliphaga phrygia*; 151, *Tropidorhynchus corniculatus*; 152, *T. citreogularis*; 153, *Entomyza cyanotis*; 154, *Plectorhynchus lanceolatus*; 155, *Acanthochaera carunculata*; 156, *Zosterops dorsalis*; 157, *Cacatua galerita*; 158, *Aprosmictus cyanopygius*; 159, *Platycercus eximius*; 160, *P. elegans*; 161, *Trichoglossus concinnus*.]

A. J. North is best known for his valuable work, *The Nests and Eggs of Birds found Breeding in Australia and Tasmania* (4 Vols., 1901-1914). He would have nothing to do with *The Emu*, official journal of the Royal Australasian Ornithologists' Union (in one instance referring to it as "A Melbourne publication") (*Vict. Naturalist*, xxii., 2, June, 1902, p. 53), but published notes of general interest and descriptions of new species in the *Victorian Naturalist*, *The Records of the Australian Museum*, and *The Agricultural Gazette of New South Wales*. To the latter publication he contributed a series of papers on "The Insectivorous Birds of New South Wales." Six parts, as listed above, complete the series, and contain brief notes on the habits, nests and eggs of the 161 species dealt with.

The influence of Gould's work is apparent in some of the plates, which are by H. S. Burton, an artist on the staff of the Department of Agriculture, New South Wales. His portrait appears in the *Agric. Gaz. N.S.W.*, xii., 1, January, 1901, opposite p. 222.

Part I of the series was re-issued as a "separate" with new pagination (1-18); II., as *Miscellaneous Publication*, No. 128 (pp. 19-31), and Part V was also re-issued as *Miscellaneous Publication*, No. 128 (pp. 1-2). W. W. Froggatt states in "Some Useful Australian Birds" (1921), p. 3, that three parts were issued separately, but such was the demand that the supply was soon exhausted.]

1901. Description of a New Species of Insectivorous Bird. *Acanthiza mastersi*, sp. nov.—xii., 11, November, p. 1425. [Re-issued as *Miscellaneous Publication*, No. 527.]
1902. Description of the Eggs of the Fawn-breasted Bower-bird and Varied Lorileet.—xiii., 4, April, p. 409, fig. [*Chlamydodera cervini-ventris* and *Ptilosclera versicolor*.]
1905. Insectivorous Birds. A New Genus of the Order Passeres.—xvi., 3, March 2, pp. 247-250, 2 figs. [*Oreoscopus*, gen. nov.—Type, *Sericornis gutturalis* De Vis. Re-issued as *Miscellaneous Publication*, No. 828 (pp. 1-4).]
1909. On Bird Protection and Bird Description in New South Wales.—xx., 2, February 2, pp. 141-147. [A general account, giving some history of "The Birds' Protection Act, 1901." He suggests the formation of "Gould Societies," a suggestion previously made at a meeting of the Linnean Society of New South Wales (Abstract of Proceedings, August 26th, 1908), when he said "Gould Societies might very advantageously be inaugurated throughout the State, to take up work on the lines so successfully followed by the Audubon Societies of the United States; and to bring about the observance of 'Bird Day' in the schools."]
1911. On a New Genus of Australian Insectivorous Birds.—xxii., 3, March 2, p. 211. [*Ashbyia*, gen. nov.]
- . Insectivorous Birds. Description of a New Sub-species of *Dacelo gigas* ("Laughing Kingfisher" or "Laughing Jackass").—xxii., 7, July 3, p. 609. [*Dacelo McLennani*, subsp. nov.]

NORTON, J.

1897. Magpies (Black and Gray).—viii., 8, August, pp. 535-537. [An account of the Streperas and their habits, with notes on food.]
- [O'GRADY, J. E.], Editor of *The Agricultural Gazette of New South Wales*, 1910-1912.
- 1910 Insectivorous Birds of New South Wales.—xxi., 4, April 2, pp. 297-299, 2 pls. (col.). [1, Hooded Robin; 2, Yellow-breasted Shrike Robin.]—xxi., 5, May 2, pp. 398-400, 2 pls. (col.). [3, Red-capped Robin; 4, Coachwhip Bird.]—xxi., 8, August 2, pp. 667-668, 2 pls. (col.). [5, Scarlet-breasted Robin; 6, Flame-breasted Robin.]—xxi., 9, September 2, pp. 778-779, 2 pls. (col.). [7, Blue Wren; 8, Orange-backed Wren.]—xxi., 12, December 2, pp. 1026-1027, 2 pls. (col.). [9, Ground Lark; 10, Jacky Winter.]—xxii., 1, January 3, pp. 36-38, 2 pls. (col.). [11, Willie Wagtail; 12, Scissors Grinder.]—xxii., 3, March 2, pp. 206-207, 2 pls. (col.). [13, Diamond Bird; 14, Crested Shrike Tit.]—xxii., 4, April 2, pp. 316-317 (col.). [15, Grey Shrike Thrush; 16, Dollar Bird.]—xxii., 6, June 2, pp. 503-504, 2 pls. (col.). [17, Sacred Kingfisher; 18, Crested Bell-bird.]

—xxii., 7, July 3, pp. 611-612, 2 pls. (col.). [19, Caterpillar Eater; 20, Yellow-breasted Thickhead.]—xxii., 10, October 3, pp. 842-843, 2 pls. (col.). [21, Laughing Jackass; 22, More-pork.]—xxii., 11, November 2, pp. 947-948, 2 pls. (col.). [23, Magpie; 24, Peewee.]—xxiii., 2, February 2, 1912, pp. 141-142, 2 pls. (col.). [25, Mistletoe Bird; 26, Welcome Swallow.]—xxiii., 3, March 2, pp. 234-235, 2 pls. (col.). [27, White-browed Wood Swallow; 28, Fairy Martin.]—xxiii., 8, August 2, pp. 663-664, 2 pls. (col.). [29, Babbler; 30, Brown Tree-creeper.]—xxiii., 9, September 2, pp. 758-759, 2 pls. (col.). [31, Short-billed Tom-tit; 32, Blue Jay.]—xxiv., 4, April 2, 1913, pp. 322-323, 2 pls. (col.). [23, Spotted Ground Bird; 34, Mountain Thrush.]—xxiv., 5, May 2, pp. 388-389, 2 pls. (col.). [35, Orange-winged Tree-runner; 36, Fan-tailed Cuckoo.]

In view of the interest shown in the series of papers by A. J. North, published by the Department of Agriculture, New South Wales, in *The Agricultural Gazette of New South Wales* (q.v.), it was decided to issue a second series under the title, "Insectivorous Birds of New South Wales." J. E. O'Grady, then editor of *The Agricultural Gazette of New South Wales*, undertook the preparation of the letterpress, with the assistance of A. J. North. The plates were copied in water-colour from the figures in Gould's *Birds of Australia*, and reproduced by the three-colour process. These reproductions are not direct copies from Gould's plates. Mr. E. H. Zeck, Entomologist, Department of Agriculture, New South Wales, informs us that water-colour drawings were made from Gould's plates by William Marshall, a compositor in the Government Printing Office, in whose work the Government Printer, William Applegate Gullick, had become interested. It was from these drawings that the blocks were made. In some instances the artist altered the backgrounds slightly, or re-set the positions of the birds. The series commenced in 1910. In 1912, O'Grady resigned from the Department, but two further papers, evidently prepared prior to his resignation, appeared in 1913. All O'Grady's papers are unsigned. W. W. Froggatt (p.v.) then continued the series under his own name until their conclusion in October, 1915. Provision had been made for reprinting the series in the form of a Bulletin, but wartime conditions in 1914-1918 delayed the appearance of the work. W. W. Froggatt then used the plates in his book, *Some Useful Australian Birds* (1921, pp. 1-85, 62 pls. (col.)), re-writing all those sections which had been dealt with by O'Grady, and revising his own contributions. Two of the plates—the White-throated Nightjar, and the Grey-crowned Babbler and Apostle Bird—are reproduced from Burton's plates in North's series (q.v.).]

SMITH, G. P. Darnell (1868-1942), Government Microbiologist, Department of Agriculture, New South Wales; Director, Botanical Gardens, Sydney, 1924-1933.

1917. Animal Aids to the Spread of Prickly Pear.—xxx., 2, February 3, pp. 125-127, 2 figs. [Emu and Black Magpies as agents in the spread of prickly pear.]

SPARKS, G. C.

1920. Baiting the Wedge-tailed Eagle.—xxxi., 12, December 2, p. 860. [Estimates that 2,000 lambs are killed per annum on one station between Wyalong and the Lachlan River by Wedge-tailed Eagles.]

QUEENSLAND.

QUEENSLAND AGRICULTURAL JOURNAL.

ANON.

1905. Destruction of Native Birds.—xvi., 2, October 1, pp. 171-174. [Contains notes by H. Tryon on the food of the Ibis, Crow, Pied Crow Shrike, Morepork (*Ninox*), Nightjar, Laughing Jackass, Kingfishers (*Halcyon* and *Alcyone*), Butcher Bird, and Dollar Bird.]
1914. Ornithology. The Economic Value of our Birds.—(n.s.), 1, January, pp. 59-61. [Reprints bulletin issued by Bird Protection Court, Melbourne, by Professor [*sic.*] F. Erasmus Wilson.]
- . Native Birds Protection Acts. Destruction of Native Birds.—(n.s.), li., 2, August, pp. 167-172, map. [Reprints Tryon's notes from *Qld. Agric. Journ.*, 1905 (*supra*). Reprinted again, li., 3, pp. 342-348; 4, pp. 323-328; 5, 367-372; 6, pp. 411-416.]
1927. Vanishing Bird Life.—xxvii., 4, April 1, pp. 356-357. [Reprinted from the *Graziers' Review* (Qld.), 16th March, 1927.]

FIELDING, J. W.

1928. Observations on Eye Worms of Birds.—xxx., 1, July 1, pp. 37-41. [Lists seven species of native birds infested.]

MELLOR, J. W.

1907. Sparrow-destroying Bird.—xxii., 1, January 1, pp. 42-43. [The author is doubtful regarding the statements by C. T. Musson. (*Agric. Gaz. N.S.W.*, 1908) re *Pteropodocys phasianella* destroying sparrows.]

WILSON, D.

1932. The Value of Bird Life.—(n.s.), xxxvii., 1, January 1, pp. 60-61.

SOUTH AUSTRALIA.

JOURNAL OF AGRICULTURE AND INDUSTRY OF SOUTH AUSTRALIA.

COLEMAN, F.

1897. The Orchard Oriole. A Friend of the Orchardist.—i., 2, September, p. 130. [Proposal to introduce *Icterus spurius*, the American Orchard Oriole, into South Australia.]

JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF SOUTH AUSTRALIA.

ANON.

1909. Bird Pests.—xiii., 1, August, pp. 26-27. [Report of Conference on Destructive Birds, June 30 and July 28, 1909.]
1919. Black-tailed Native Hen.—xxii., 7, February, pp. 556-557, fig.

after Gould. [Invasion of Murray River Settlements by Native Hen, and refers to invasion of streets of Adelaide, 1846; Perth, 1886; Northern Victoria, 1909.]

1933. The Grenadier Weaver.—xxxvii., 4, November 15, p. 438, pl. (col.). [*Pyromelana* [*Euplectes*] *orix* from South Africa introduced into South Australia, and occurring wild at Woods Point, Paradise, and McLaren Flat, feeding on wild oats. May become a serious menace to grain crops in South Australia.]

CURNOW, S. H.

1909. Some Indigenous Insectivorous Birds.—xiii., 1, August, pp. 17-20. [General notes on *Malurus cyaneus*, *Rhipidura tricolor*, *Sisura* [*sic.*] *inquieta*, *Microeca fascinans*, *Petroeca* spp., *Hirundo* spp., *Collyriocincla harmonica*, *Anthus australis*, *Pomatorhinus superciliosus*, *Acanthiza chrysorrhoe*.]

[EDQUIST, A. G.], Lecturer in Nature Study, Education Department, South Australia.

- 1911 Our Feathered Friends. Protected Native Birds.—xiv., 9, April, pp. 848-855, 3 pls. (col.). [Coloured plates of birds and eggs by C. Wall, Government Artist, reproduced by photolithograph, with notes on derivation of scientific name, size, bill, feet and legs, plumage, habitat, food, nest and eggs, and occasional general notes. The first part contains *Podargus humeralis* (fig.), *Athene boobook* (fig.), *Pardalotus striatus* (fig.), *Acanthiza chrysorrhoa* (fig.), *Acrocephalus australis* (fig.), *Grallina australis* (fig.).]—xiv., 10, May, pp. 936-939, 3 pls. (col.). [*Colluricincla harmonica* (fig.), *Graucalus melanops* (fig.), *Cuculus inornatus* (fig.), *Herodias plumiferus* (fig.).]—xiv., 11, June, pp. 1038-1042, 3 pls. (col.). [*Chlamydodera maculata* (fig.), *Climacteris scandens* (fig.), *Artamus sordidus* (fig.), *Anthus australis* (fig.), *Epthianura albifrons* (fig.).]—xiv., 12, July, pp. 1136-1140, 3 pls. (col.). [*Platalea regia* (fig.), *Geronticus spinicollis* (fig.), *Botaurus australis* (fig.), *Ardea novae-hollandiae* (fig.), *Hydrochelidon fluvialis* (fig.).]

[Largely reprinted from a Special Bulletin, Department of Information, South Australia (q.v.).]

LEA, A. M. (1868-1932), Entomologist, South Australian Museum, Adelaide.

1922. One Year's Food of an Owl near Adelaide.—xxv., 11, June 15, pp. 938-942, illustrated. [Summary of one year's food of one individual of *Tyto alba delicatula*—1,407 mice, 143 rats, 7 bats, 5 young rabbits, 375 sparrows, 23 starlings, 8 blackbirds, 4 Little Water-crakes, 2 Chestnut-eared Finches, 2 Grey Shrike-thrushes, 1 Goldfinch, 1 Grass Bird (*Cisticola exilis*), 1 Flycatcher (*Microeca fascinans*), 1 New Holland Honey-eater, 4 unidentified small birds, 4 small lizards, 174 frogs, 25 large night-flying moths, 5 Field Crickets (*Gryllus servillei*), 1 Mole Cricket (*Gryllotalpa coarctata*), 1 carnivorous cricket (*Gryllacris* sp.), 1 grasshopper, 1 Katydid, 1 cockroach, 2 Mantids, 2 large cockchafer beetles, 2 root beetles (*Isodon pentacanthus*), 4 Dung Beetles (*Onthophagus mnischei*), 2 *O. pentacanthus*, 13 Night beetles (*Bolboceras* sp.).]

1926. The Food of Birds.—xxx., 4, November 15, p. 378. [Abstract of paper read before 37th Annual Congress, Agricultural Bureau of South Australia. Silvereyes spreading seeds of African Box-thorn and Blackberry; food of owls; Emu (grass, salt-bush, and other plants eaten by sheep—"eats same quantity per day as a sheep"—spreads Quandong and prickly pear.)]

PLACE, F. E.

1922. Blowflies and Sheep.—xxv., 8, March 15, pp. 700-705. [The value of birds, p. 703.]

WHITE, S. A. (1870—), South Australian ornithologist and explorer. Portrait in *Aust. Av. Rec.*, iii., 7 (3rd December), 1919.

1918. A Few Native Birds in Relation to the State.—xxii., 2, September, p. 174. [Abstract of lecture. Details of food of Barn Owl, cormorants, and quail.]

1919. Advisory Board of Agriculture.—xxii., 9, April, p. 729. [Note on disappearance of Black-tailed Native Hen from areas which were invaded on the Murray River settlements. Vide Anon, 1919 (*supra*).]

- . Bird Life.—xxii., 9, April, p. 748. [Abstract of lecture. Food of delicate Owl at Reedbeds, S.A.; in six months one bird had destroyed 640 sparrows, 64 starlings, 1,600 mice, and 60 young rabbits, in addition to thousands of insects. A Blue Wren conveyed an average of three insects to the young every two minutes, working 16 hours per day. One bird, therefore, destroyed 1,400 insects per day, or 2,800 for the pair.]

TASMANIA.

THE AGRICULTURAL GAZETTE OF TASMANIA.

BUTLER, A. L.

1912. Economic Value of Birds. (Chairman's Address to the Tasmanian Field Naturalists' Club, 19th September, 1912.)—xx., 9, September, pp. 371-378. [A general account.]

VICTORIA.

THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF VICTORIA.

BEUHNE, F. R., Apiculturalist, Department of Agriculture, Victoria.

1914. Bee-keeping in Victoria—Enemies of Bees—Birds.—xii., 4, April, pp. 202-205, illustrated. [*Merops ornatus* and *Artamus personatus* as destroyers of bees. Illustrations are half-tone reproductions of paintings by C. C. Brittlebank.]

FRENCH, C. (1843-1933), Government Entomologist, Department of Agriculture, Victoria, 1889-1911.

1902. Economic Entomology and Ornithology: Some of the Advantages to be Derived from their Study.—i., 1, January, pp. 59-68. [A general account.]

1902. On the Necessity for the Preservation of Our Insect-destroying

Birds, with an Alphabetical List of the Principal Kinds.—i., 1, January, pp. 69-73. [General notes and list of species.]

- 1902 Insectivorous Birds of Victoria.—i., 2, February, pp. 200-202, 2 pls. (col.), by C. C. Brittlebank. [*Tinnunculus cenchroides* (fig.),
to *Merops ornatus* (fig.)].—i., 4, April, p. 403, pl. (col.). [*Malurus*
1907. *cyaneus* (fig.)].—i., 5, May, pp. 520-521, 2 pls. (col.). [*Artamus personatus* (fig.), *Melanodryas bicolor* (fig.)].—ii., 1, May, 1903, pp. 68-69, pl. (col.). [*Pomatorhinus temporalis* (fig.)].—iii., 10, November, 1904, p. 1,000, pl. (col.). [*Acanthiza chrysorrhoa* (fig.)].—iv., 12, December 8, 1906, pp. 716-717, pl. (col.). [*Grallina picata* (fig.)].—v., 2, February 8, 1907, pp. 78-79, pl. (col.). [*Eopsaltria australis* (fig.)].—v., 4, April 8, 1907, pp. 209-210, pl. (col.). [*Psophodes crepitans* (fig.)].

[There is considerable variation in the titles of the papers in this series, some being prefaced by "Entomological and Ornithological Branch," some by the words "Economic Entomology and Ornithology," while others are without any special heading, simply commencing with the name of the bird. All the plates are from paintings by C. C. Brittlebank, Plant Pathologist and Artist, Department of Agriculture, Victoria. With the exception of the plates of *Melanodryas bicolor* and *Eopsaltria australis*, all were used in French's *Destructive Insects of Victoria* (q.v.).]

FRENCH, C. (Jr.) (1868—), Former Government Entomologist, Department of Agriculture, Victoria.

1905. Fruit-eating Birds.—iii., 5, July 8, pp. 364-370. [*Corone australis*, *Strepera fuliginosa*, *S. cuneicaudata*, *Oriolus viridis*, *Graucalus melanops*, *Ptilinorhynchus violaceus*, *Chlamydodera maculata*, *Zosterops caerulescens*, *Meliphaga phrygia*, *Ptilotis chrysops*, *P. leucotis*, *P. penicillata*, *Manorhina* (*Myzantha*) *garrula*, *Acanthochaera carunculata*, *A. ruficularis*, *Entomya cyanotis*, *Philemon corniculatus*, *Trichoglossus novae-hollandiae*, *Glossopsittacus concinnus*, *Aprosmictus cyanopygius*, *Platycercus elegans*, *P. eximius*, *Nanodes discolor*. Introduced Birds: *Acridotheres ginginianus*, *Passer domesticus*, *Sturnus vulgaris*, *Turdus merula*. Notes on food, etc.]
1906. Destructive Birds.—iv., 11, November 8, pp. 679-681. [A general account.]
1910. Insectivorous Birds of Victoria.—viii., 3, March, pp. 186-187, illustrated. [*Chalcococcyz plagosus*. The illustration is a half-tone reproduction of a painting by C. C. Brittlebank, and is not used elsewhere.]—ix., 8, August, p. 552, pl. (col.). [*Climacteris leucophaea*. The plate is from a painting by C. Vald Andersen, and does not appear elsewhere. These papers are a continuation of the series by C. French (Sr.) (q.v.).]
1914. Birds Destructive to Vegetable Crops—English Skylarks (*Alauda arvensis*).—xii., 12, December, pp. 736. [English Skylarks destroying cabbage, cauliflower, turnip, lettuce, radish in Currum, Mentone, and Cheltenham districts, Victoria.]

WESTERN AUSTRALIA.

JOURNAL OF THE DEPARTMENT OF AGRICULTURE
OF WESTERN AUSTRALIA.

HALL, Robert.

1900. The Insectivorous Birds of Western Australia.—ii., 5, November, to 1900, pp. 321-329, illust. and map. [Introduction, *Pardalotus punctatus*, *P. assimilis*, *P. ornatus*.]—ii., 6, December, 1900, pp. 388-397, illust. [*Artamus superciliosus*, *A. personatus*, *A. sordidus*.]—iii., 1, January, 1901, pp. 18-25, illust. [*Hirundo neoxena*.]—iii., 2, February, 1901, pp. 96-99, illust. [*Petrochelidon ariel*, *P. nigricans*, *Cheramoeca leucosternum*.]—iii., 3, March, 1901, pp. 170-177, illust. [*Pseudogerygone culicivora*, *Acanthiza apicalis*, *A. inornata*, *A. chrysorrhoea*, *Smicrornis flavescens*, *Falcunculus leucogaster*.]—iii., 4, April, 1901, pp. 239-246, illust. [*Rhipidura preissi*, *R. tricolor*, *Sisura inquieta*, *Microeca assimilis*, *Smicrornis flavescens* (addenda).]—iii., 5, May, 1901, pp. 299-306, illus. [*Petroeca campbelli*, *P. goodenovii*, *P. bicolor*, *Eopsaltria georgiana*, *E. gularis*.]—iii., 6, June, 1901, pp. 367-376, illus. [*Malurus elegans*, *M. lamberti*, *Stipiturus malachurus*, *Amytis striata*.]—iv., 1, July, 1901, pp. 17-32, illust. [*Pachycephala occidentalis*, *P. rufiventris*, *P. gilberti*, *Cuculus pallidus*, *Cacomantis flabelliformis*, *Misocalius palliolatus*, *Chalcococcyx plagosus*, *Graucalus melanops*, *Pteropodocys phasianella*, *Lalage tricolor*.]—iv., 2, August, 1901, pp. 82-87, illust. [*Sericornis maculata*, *S. brunnea*, *Hylacola pyrrhopygia*, *Calamanthus campestris*.]—iv., 3, September, 1901, pp. 177-182, illust. [*Gymnorhina tibicen*, *G. leuconota*.]—iv., 4, October, 1901, pp. 246-252, illust. [*Grallina picata*, *Cinclorhynchus rufescens*, *Anthus australis*.]—iv., 5, November, 1901, pp. 312-319, illust. [*Collyriocincla rufiventris*, *Cinclosoma castanonotum*, *Sittella pileata*, *S. leucoptera*, *Climacteris rufa*.]—iv., 6, Dec., 1901, pp. 380-387, illust. [*Pomatorhinus superciliosus*, *Oreoica cristata*, *Xerophila leucopsis*, *Sphenostoma cristatum*, *Eurystomus australis*, *Psophodes nigrogularis*.]—v., 1, January, 1902, pp. 6-12, illust. [*Ephthianura aurifrons*, *E. albifrons*, *Dacelo cervina*, *Halcyon sanctus*, *H. pyrrhopygius*.]—v., 2, February, 1902, pp. 102-109, illust. [*Caprimulgus macrurus*, *Eurystopus argus*, *Aegotheles novae-hollandiae*, *Podargus strigoides*, *Merops ornatus*.]—v., 3, March, 1902, pp. 178-182, illust. [*Carphibis spinicollis*, *Notophoxyx novae-hollandiae*, *Burhinus grallarius*.]—v., 4, April, 1902, pp. 258-266, illust. [*Aegialitis melanops*, *Hypotaenidia phillippinensis*, *Podiceps novae-hollandiae*, *Cerchneis cenchroides*, *Hieracidia berigora*.]—v., 5, May, 1902, pp. 304-309, illust. [*Elanus scriptus*, *Ninox ocellata*, *Corone australis*, *Cracticus leucopterus*.]—Part III. Birds: Insectivorous and granivorous.—v., 6, June, 1902, pp. 374-378, illust. [*Lipoa ocellata*.]—vi., 1, July, 1902, pp. 6-11, illust. [*Turnix varia*, *Synoecus australis*, *Megalurus gramineus*, *Mirafra horsfieldi*, *Cisticola exilis*, *Acrocephalus longirostris*.]—Part IV. Birds: Insectivorous and Frugivorous. (More or less Useful.)—vi., 2, August, 1902, pp. 70-77, illust. [*Strepera plumbea*, *Zosterops gouldi*, *Melithreptus chloropsis*, *Acanthochaera carunculata*.]—vi., 5, November, 1902, pp. 283-287. [*Acanthochaera ruficularis*, *Philemon citreogularis*,

Chlamydodera nuchalis, *Oriolus sagittata*.]—Part V. Birds: Insectivorous and Graminivorous.—vi., 6, December, 1902, pp. 252-253, pl. [*Dromacus novae-hollandiae*].—Part VI. Birds: Offensive in Certain Seasons to Fruitgrowers and Agriculturalists.—vii., 1, January, 1903, pp. 6-12. [*Platycercus icterotis*, *Glossopsittacus porphyrocephalus*, *Trichoglossus rubritorques*, *Cacatua galerita*.]

[The series forms a good account of the birds of Western Australia. The treatment is on the same lines as the author's books, *The Insectivorous Birds of Victoria*, 1900, and *The Useful Birds of Southern Australia*, 1907. A description is given of each bird, together with notes on nest and eggs, habits, distribution, etc., with special reference to the western State. The numerous illustrations are half-tone reproductions of Gould's plates and from original photographs.]

HELMS, R. (1858-1914). Portrait in *Agric. Gaz. N.S.W.*, xii., 1, January, 1901, opposite p. 114.

1900. Useful and Noxious Birds. The Goat-Suckers (Caprimulgidae).—i., March, pp. 17-23. [General notes of food, habits, etc., of *Caprimulgus macrurus*, *Eurystopodus guttatus*, *Aegotheles novae-hollandiae*, *Ae. leucogaster*, *Podargus humeralis*, *P. megacephalus*, *P. brachypterus*, *P. cuvieri*, *P. plumiferus*, *P. phalaenoides*, *P. gouldi*, *P. marmoratus*, *P. papuensis*.]

1902. Houtman's Abrolhos.—v., 1, January, pp. 33-35, illust. [Historical, Economic Value, Physiography, Flora, Marine Life, Terrestrial Fauna, Birds and Their Nests; pp. 45-51, Mammals, Conclusion, Appendix List of Mammals, Birds, Reptiles and Frogs. Reprinted from *Producers' Gazette*.]

NEWMAN, L. J. (1878—). Former Government Entomologist, Department of Agriculture, Western Australia.

1924. Protection of Useful Insects, Birds, and Animals.—(2), i., 1, April, pp. 45-47.

1929. Biological Control of the Silvereye (*Zosterops gouldi*).—(2), vi., 2, June, pp. 223-226, illust. [Damage by Silvereyes, and control by Butcher-birds. Notes on the rearing and feeding of *Cracticus destructor*.]

BOOKS.

FROGGATT, W. W.

1923. *Forest Insects of Australia* (Sydney), pp. 1-17. [Chapter I. The Economic Value of Birds in Forests, pp. 7-8.]

1927. *Forest Insects and Timber Borers* (Sydney), pp. 1-107. [Forest Zoology—Birds, p. 7. The Forest Guardian. The Black Cockatoo (*Calyptorhynchus funereus* Shaw), pp. 8-9, coloured plate (frontis) after Gould. Notes are given on the food and habits of the bird.]

FRENCH, C.

Handbook of the Destructive Insects of Victoria (Melbourne), 5 volumes.

1891. Part I. Chapter iv. On the Necessity for the Preservation of Our Insect-destroying Birds, with an Alphabetical List of the Principal Kinds. Pp. 24-29.

1893. Part II. Chapter xli. Fruit and Grain Eating Birds. Pp. 181-183.
1900. Part III. Chapter lxii. The White-eyebrowed Wood Swallow (*Artamus superciliosus* Gould), pp. 139-140, pl. vl. (col.); Chapt. lxiv., The White-rumped Wood Swallow (*Artamus leucogaster* Val.), pp. 141-142, pl. vl. (col.); Chapt. lxv., The Narrow-billed Bronze Cuckoo (*Lamprolaima basalis* Hors.), pp. 143-144, pl. lix. (col.); Chapt. lxvi., The Pallid Cuckoo (*Cacomantis pallidus* Lath.), pp. 145-147, pl. lx. (col.); Chapt. lxvii., The Restless Flycatcher (*Seisura inquieta* Lath.), pp. 149-150, pl. lxi. (col.); Chapt. lxviii., The White-shafted Fantail (*Rhipidura albiscapa* Gould), pp. 151-153, pl. lxii. (col.); Chapt. lxix., The Brown Tree Creeper (*Climacteris scandens* Temm.), pp. 155-156, pl. lxiii. (col.); Chapt. lxx., The White-throated Tree Creeper (*Climacteris leucophaea* Tatham) [sic.], pp. 157-158, pl. lxiv. (col.).

The coloured plates in the first three parts are from paintings by C. C. and T. A. Brittlebank, and do not appear in C. French's series in *The Journal of the Department of Agriculture of Victoria* (q.v.).

1909. Part IV. Chapter xcii. The Masked Wood-Swallow (*Artamus personatus* Gould), pp. 147-149, pl. lxxxv. (col.); Chapt. xciii., The Babbler or Codlin Moth Bird (*Pomatophilus temporalis* V. & H.), pp. 151-153, pl. lxxxvi. (col.); Chapt. xciv., The Nankeen Kestrel (*Tinnunculus cenchroides* V. & H.), pp. 155-157, pl. lxxxvii. (col.); Chapt. xcv., The Magpie Lark (*Grallina picata* Lath.), pp. 159-161, pl. lxxxviii. (col.); Chapt. xcvi., Owllet Nightjar (*Aegotheles novae-hollandiae* V. & H.), pp. 163-164, pl. lxxxix. (col.); Chapt. xcvi., White-throated Thickhead (*Pachycephala gutturalis* Lath.), pp. 165-166, pl. xc. (col.); Chapt. xcvi., The Flame-breasted Robin (*Petroeca phoenicia* Gould), pp. 167-169, pl. xci. (col.); Chapt. xcix., The Red-capped Robin (*Petroeca goodenovii* V. & H.), pp. 171-172, pl. xcii. (col.); Chapt. c., The Harmonious, or Grey Shrike, Thrush (*Collyriocinclia harmonica* Gould), pp. 173-175, pl. xciii. (col.); Chapt. ci., The Welcome Swallow (*Hirundo neoxena* Gould), pp. 177-178, pl. xciv. (col.); Chapt. cii., The Yellow-rumped Tom-tit (*Acanthiza chrysorrhoa* Quoy & Gaim.), pp. 179-180, pl. xcv. (col.); Chapt. ciii., The Australian Bee-eater (*Merops ornatus* Lath.), pp. 181-182, pl. xcvi. (col.); Chapt. civ., The Blue Wren or Superb Warbler (*Malurus cyaneus* Ellis), pp. 183-185, pl. xcvi. (col.); Chapt. cv., White-browed Babbler, or Codlin Moth Bird (*Pomatostomus superciliosus* V. & H.), pp. 187-188, pl. xcvi. (col.).

Coloured plates are from paintings by C. C. Brittlebank. All the plates, with the exception of lxxxix., xc., xcii., xciii., xciv., and xcvi., appeared in the series in *Agric. Journ. Vic.*

1911. Part V. Chapter cxxxiii. White Ibis (*Ibis molucca* Cuvier), pp. 139-140, pl. cxxvii. (col.); Chapt. cxxxiv., Straw-necked Ibis (*Carphibis spinicollis* Reich.), pp. 141-148, pl. cxxviii. (col.); Chapt. cxxxv., White-fronted Heron (*Notophox novae-hollandiae* Lath.), pp. 143-144, pl. cxxix. (col.); Chapt. cxxxvi., Australian Bustard or Wild Turkey (*Eupodotis australis* J. E. Gray), pp. 145-146, pl. cxxx. (col.); Chapt. cxxxvii., Giant Kingfisher or

"Laughing Jackass" (*Dacelo gigas* Leach), pp. 147-148, pl. cxxxi. (col.); Chapt. cxxxviii., White-backed Magpie or Crow Shrike (*Gymnorhina leuconota* Gould), pp. 149-150, pl. cxxxii. (col.); Chapt. cxxxix., Yellow-breasted Robin (*Eopsaltria australis* Lath.), pp. 151-152, pl. cxxxiii. (col.); Chapt. cxi., Southern Stone Plover (*Burhinus grallarius* Lath.), pp. 153-154, pl. cxxxiv. (col.); Chapt. cxli., Boobook Owl (*Ninox boobook* Lath.), pp. 155-156, pl. cxxxv. (col.); Chapt. cxlii., Spine-tailed Swift (*Chaetura caud-acuta* Lath.), pp. 157-158, pl. cxxxvi. (col.); Chapt. cxliii., Reed Warbler (*Acrocephalus australis* Gould), pp. 159-160, pl. cxxxvii. (col.); Chapt. cxliv., White-throated Nightjar (*Eurystopus albigularis* V. & H.), pp. 161-162, pl. cxxxviii. (col.).

Plates cxxvii., cxxix., cxxxiii., cxxxv., cxxxvii. are by C. Vald Andersen; cxxxii., cxxxiv., cxxxvi. and cxxxviii. by C. C. Brittlebank; cxxx., cxxxi. are unsigned. In some of these illustrations the eggs are figured. None of these plates appeared elsewhere.]

BULLETINS.

NEW SOUTH WALES.

1890. Department of Agriculture, New South Wales. Bulletin No. 1. Report of the Conference of Fruit-growers and Vine-growers, together with appendices. October, 1890.

[This Bulletin contains papers on Australian Economic Ornithology: these are listed as under:—

HAMILTON, A. G.

Birds which are Enemies or Friends of Fruit-growers.—pp. 151-154. 108 species are listed.

NORTON, Hon. James.

Australian Birds; Useful and Noxious.—Appendix G., pp. 245-255. Sixty-seven species are specifically referred to, besides many others in general terms. Deals principally with the good and bad qualities of the birds as they affect the agriculturist and horticulturist. Dated 8th September, 1890.]

RAMSAY, E. P.

Birds Useful to Agriculturalists, Fruit-growers, and Farmers.—Appendix F., pp. 240-244. Eighty-nine species of insectivorous birds, usually found in and about gardens and orchards in New South Wales, are listed.

1918. The Food of Australian Birds. An Investigation into the Character of the Stomach and Crop Contents. A Summary of Work done by J. B. Cleland, M.D., Principal Microbiologist, Department of Public Health; J. H. Maiden, Government Botanist of New South Wales, and Director, Botanic Gardens, Sydney; W. W. Froggatt, F.L.S., Government Entomologist; E. W. Ferguson, M.B., Ch.M., Assistant Microbiologist, Department of Public Health; C. T. Musson, Lecturer in Botany and Entomology, Hawkesbury Agricultural College. *Department of Agriculture, New South Wales. Science Bulletin*, No. 15. July, 1918, pp. 1-112.

[Introduction (J. B. Cleland), pp. 3-21. Introductory Note to Appendices I. and II. (J. B. Cleland), pp. 22-23. Appendix

I. Tabulated Examination of the Contents of Stomachs and Crops of each Species of Australian Birds, etc., examined, pp. 24-43. Appendix II. Tabulated Examination of the Contents of Stomachs and Crops of the Individual Australian Birds, etc., examined, pp. 44-49. Appendix III. Tabulated Examination of the Contents of Stomachs and Crops of the individual Australian Birds, etc., examined by C. T. Musson, pp. 100-112.]

[This Bulletin contains details of the examination of the stomach contents of 1,000 birds. Some of the results were published for the first time in *The Emu*, ix., April, 1910, pp. 219-226; *The Emu*, xi., October, 1911, pp. 79-95; and in *The Agricultural Gazette of New South Wales* for May, 1910, (q.v.) results were given of examination of 200 birds, and these are included here. In the *Second Report of the Government Bureau of Microbiology*, Department of Public Health, New South Wales, for the years, 1910-1911, p. 192, the results of the examination of 243 more birds, as well as of the 200 mentioned above, are given. This was supplemented by the results of another 100 birds, published in the *Third Report of the Government Bureau of Microbiology*, Department of Public Health, New South Wales, 1912, p. 181. The matter contained in this Bulletin was originally collected and arranged with a view to publication about April, 1915, but various circumstances connected with the war of 1914-1918 delayed publication until July, 1918]

SOUTH AUSTRALIA.

EDQUIST, A. G., Lecturer in Nature Study, Department of Education, South Australia.

1910. The Protected Birds of South Australia. South Australia, The Department of Intelligence. Special Bulletin, pp. 1-30, 12 pls. (col.), by C. Wall.

[Introduction (A. G. Edquist); Protect Our Birds (T. Duffield); Destruction of Birds (A. G. Edquist); Description of Our Native Birds (A. G. Edquist); Boobook Owl (Mopoke) (*Athene boobook*) (fig.); Tawny-shouldered Podargus, or "Frogmouth" (*Podargus humeralis*) (fig.); Wood Swallow (*Artamus sordidus*) (fig.); Brown Tree Creeper (*Climacteris scandens*) (fig.); Striated Pardalote (*Pardalotus striatus*), or Diamond Bird (fig.); Yellow-rumped Tom-tit, or Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*) (fig.); Reed Warbler (*Acrocephalus australis*) (fig.); Magpie Lark, Murray Magpie, Pied Grallina, Mudlark, or Pee-wee (*Grallina australis*) (fig.); Harmonious Shrike Thrush (*Colluricincla harmonica*) (fig.); Blue Dove, or Black-faced Graucalus (*Graucalus melanops*) (fig.); White-fronted Chat (*Ephthianura albifrons*) (fig.); Ground Lark, or Pipit (*Anthus australis*) (fig.); Spotted Bower Bird (*Chlamydodera maculata*) (fig.); Pallid Cuckoo, or Unadorned Cuckoo (*Cuculus inornatus*) (fig.); Straw-necked Ibis (*Geronticus spinicollis*) (fig.); Royal Spoonbill (*Platalea regia*) (fig.); Yellow-legged Spoonbill (*Platalea flavipes*) (fig.); Plumed Egret (*Herodias plumiferous*) (fig.); White-fronted Heron, or Blue Crane (*Ardea novae-hollandiae*) (fig.); Australian Bittern, or Boomer (*Botaurus australis*) (fig.); Marsh Tern (*Hydrochelidon fluvialis*) (fig.).

[References are given to the names used in Mathews' Hand List. Each species is dealt with under the following headings:— Other species in South Australia, Size, Bill, Legs, Plumage, Habitat, Food, Nest, Eggs, and in some cases with additional general notes. The Bulletin owes its origin to Thos. Duffield, Secretary to the Commissioner of Crown Lands. The plates are reproduced by photo-litho from paintings by C. Wall, Government Artist, and figure both birds and eggs. The publication was issued to every public school and institution, and police stations throughout the State. The coloured plates and portion of the text were reprinted in *The Journal of the Department of Agriculture of South Australia* (q.v., Edquist, 1911-1912).]

THE "GUNDLACHIA" PUZZLE.

By TOM IREDALE.

(Contribution from The Australian Museum, Sydney, N.S.W.)

Another step towards the elucidation of the Molluscan "*Gundlachia*" puzzle is here presented. In this Journal, Vol. x., p. 229, April 30, 1943, I sketched the history of the capbearing Australian Ancylicids, and introduced the name *Problancylus* for these, as obviously *Gundlachia* was not applicable. The small freshwater Limpets, known as Ancylicids, have a world-wide distribution, and a curious apparent aberration was discovered in Cuba, and named *Gundlachia*. A similar aberration turned up in New Zealand and Tasmania, and then in South Australia and Victoria. From examination of the records I concluded that *Problancylus* was almost certainly an aberrational development, occurring in stagnant water.

Now Sgt. F. Elkington Allen has brought in a series of *Problancylus*, from a backwater of the Peel River, near Tamworth, N.S.W., the first record from this State. The shell is large for the genus, elongate oval, parallel-sided, bearing a cap on the sinister apex, the right edge of the shell advanced beyond the apex. Sculpture of fine radial striae. The cap is small, notable, not detached, though obliquely placed. Interiorly the entrance to the cap is seen as figured by Hedley. The N.S.W. shell measures 5.25 mm. in length by 3 mm. in breadth by 1.75 mm. in height; it is longer and the cap does not project as in *petterdi*, and is here named *Problancylus anticipatus*, sp. nov. It will be figured later.

Even more interesting is a series of Ancylicids, collected by Dr. Consett Davis, in the Harding Ranges, North-west Australia, which perpetuate the cap of *Problancylus* in the adult. The shell, measuring 3 mm. by 1.5 mm. by .75 mm., is from above a very ordinary parallel-sided *Ancylus*, but the under-surface shows a shelf extending two-thirds of the shell, leaving only a small aperture exactly as in the *Problancylus* cap, this aperture being narrower than broad, only 1 mm. in length.

This is named as the type of a new genus and species, *Stimulator consetti*, and its discovery must lead to a revision of the "*Gundlachia*" puzzle, even providing later the solution.

THE KILLER WHALES OF TWOFOLD BAY, N.S.W., AUSTRALIA,
GRAMPUS ORCA.

By C. E. WELLINGS.

(Plate xv.)

During the early settlement of Australia the whaling industry provided probably the most remarkable association ever recorded as between man and non-domesticated animals. Such a strange co-operation between killer whales and the open-boat whaling crews of the Twofold Bay whaling station may seem incredible, but for almost 100 years this state of affairs definitely existed, the following account being reliable and authentic.

Killer whales are known in all oceans, particularly about the Antarctic region. They belong to the toothed species, *Grampus orca*. The body is much like that of the porpoise, stout, but streamlined. Length, to about 20 feet, skin black with white patches behind the dorsal fin and on under-part of body; jaws show great strength, with large pointed conical teeth which interlock. The high dorsal fin is a distinctive feature. Food consists of almost anything, seals, porpoises, fish, sharks, squid, penguins, etc. They are very savage, resembling in this way a pack of wild dogs, and are capable of great speed.

"Tom," whose skeleton is preserved in the Eden Museum, was one of a pack or school of about 20 to 30 that visited Twofold Bay every year during the whaling season, June to November. Mr. Geo. Davidson, master-whaler, has told me that when he was 14 years of age (1878) the killers lived as three mobs or families, known then as "Hookey's," "Stranger's," and "Cooper's" mobs, though all worked together attacking a whale, and that there were then 27 of them altogether. Of later years they all formed one pack. They arrived here a week or so in advance of the whales and made their home in the bay near Red Point (Jews Head) locally known as South Head, and upon which stands Boyd's Tower. They cruised about the bay or a few miles north or south, invariably returning each evening. Several of them were easily recognised, chiefly by their fins, and were accordingly named. "Tom" had a particularly high fin with an indentation near the top. "Humpty's" fin was bent round almost touching his side. "Hookey's" fin was bent to the right at an angle of about 45°. These fins, consisting of cartilage and not bone, probably were damaged by a whale's tail during an attack in early life. The following are names by which some were recognised in the early days of whaling, as far back as the year 1800. "Hookey," "Humpty," "Stranger," "Cooper," "Tom," "Jackson," "Typee," "Kincher," "Jimmy," "Albert," "Old Ben," "Young Ben."

Of these, several disappeared and young ones arrived. "Old Ben" died off Mowara Point, "Young Ben" later disappeared, "Jimmy" fouled the buoy-line fast to a dead whale and was found drowned when the line was taken in next morning, "Jackson" also fouled a buoy-line some years later, but being noticed in difficulty the whaling crew rescued him. The line was unwound by Geo. Davidson, the killer remaining quiet and then it "flop-tailed" before making off. In 1901 "Typee" became stranded on Aslings beach, together with a small species of whale, locally known as a grampus, which was being attacked by the pack. In order to claim recognised ownership with the object of selling the whale to the crew, a local resident

killed both. This incident caused much annoyance to the whaling crew, who had endeavoured to arrive in time to try and rescue the killer by an attempt to tow him off.

"Tom" developed a bad habit of getting across the slack line between the whale and boat, holding it under a fin and towing the boat in any direction. This habit was deliberate, and appeared to be mischief, though a nuisance. Even small boats whilst fishing have had the kellick line taken and the boat dangerously towed off. It was suggested that he at times took the line in his teeth and that the missing teeth in the top jaw were broken out in this way. However, upon examination of the skeleton, a well-known dental surgeon positively attributed their loss as the result of a severe abscess.

As whales passed Twofold Bay, travelling north along the coast and returning again later in the season, the killer whales attacked them, working much in the manner of a pack of savage dogs. Some kept wide outside, making as much noise as possible to prevent escape into deep water; others attacked by tearing the whale's lips away and so caused drowning; also, as the whale came to the surface for air a killer would often lay over the head to cover the nostrils to prevent breathing. The Eden whaling crew having attacked and harpooned the whale, the mutual assistance was of advantage to both crew and killers. The dead whale provided a feast of tongue for the killers; evidently this is very choice, for except the lips, no other portion was touched. The assistance to the Eden whaling crews resulted in many more whales being caught than otherwise was possible, often, too, during the darkest nights.

The killers certainly recognised the assistance of the boats, for at night when "watch" is almost useless, often have one or two killers arrived off the whaling station and, by making much noise "blowing" and "flop-tailing," attracted the crew, who would launch the boats and follow the killers, which stayed near about the boat until the whale attacked by the other killers was reached, perhaps two miles distant. During daylight, when the boats were off at "rush oh" alarm, killers would meet them a mile or so from the whale and accompany them to the "chase."

The alliance between the killer whales and the whaling crews probably came about in this way: When a whale was killed it usually sank to the sea bottom, to rise again, after decomposition set in, in about 20 hours; in the meantime the "killers" enjoyed a feast of its tongue. Not being molested by the whale-boats, fear of them was dispelled, and association developed, resulting in mutual assistance of advantage to both.

When the whaling industry languished, about 1912, the school of killers did not re-appear, only occasionally were one or two seen again; perhaps the school was destroyed or dispersed by the whaling fleets in the Antarctic region.

On Wednesday, September 17th, 1930, a "killer" was seen floating dead in the bay, and upon investigation it was found to be "Tom," who evidently had died a day or two earlier. Mr. J. R. Logan, of "Edrom," East Boyd, Eden, became interested to preserve the skeleton as of historic value, and with the assistance of Geo. Davidson, master-whaler, this was accomplished with great success and satisfaction.

"Tom" was 22 ft. long; tail-flukes, from point to point, 5 ft.; the tail, as in all whales, is horizontal with the body (not vertical, as in a fish); the

dorsal fin was 5 ft. 8 in. high, and the side-fins 4 ft. 6 in. long by 2 ft. 10 in. wide.

It is surprising to notice that many visitors do not know that a whale is a mammal, not a fish, so it is interesting to note the skeleton formation. There are 50 vertebrae—13 ribs (one floating). The side-fins represent the modified forearms of land animals, including the bones of the hand, the two bones (ulna and radius) of the forearm, the (humerus) bone of the upper-arm and the shoulder blade. The head and jaw bones are massive and rounded, not beaked like a dolphin, and the tongue and ear-bones are present.

In order to maintain the true length, pieces of wood were inserted between the vertebrae to replace the cartilage. The high dorsal fin is composed of flesh and cartilage, so this also could not be preserved.

With "Tom's" skeleton, now an exhibit in the Eden Museum, are a few bones of whales killed at Eden—jaw bones, ribs and vertebrae. One vertebrae is from a "fin-back" whale which was 97 feet long.

I was a resident of Eden in my early life and saw many "chases" and captures of whales from the cliff shores round the town. During several whaling seasons I lived in the home of Mr. George Davidson, master-whaler, working among the whalers, and have taken part in the capture of whales as a member of the whale-boat's crew. The opportunity for personal observation has thus been exceptional and from notes and photographs I made during this time the above account has been put together.

KILLER WHALES IN SOUTH AUSTRALIA.

Under this heading Mr. Bernard C. Cotton retails in "The South Australian Naturalist" for December, 1943, an account of Killer Whales seen in South Australia. Mr. Sydney E. C. Gay was the relater of the incident, as follows:—"While out fishing in a 35-foot boat, two miles south of Port MacDonnell, south-east of South Australia, on December 10, 1942, he saw a large Whale cow, apparently the Blue Whale (*Balaenoptera musculus*), about 70 feet in length, and a calf about 35 feet in length, being pursued, or rather herded, beachwards by eleven Killer Whales. The Killers were furiously and ferociously pursuing both cow and calf, diving and swimming rapidly, and apparently attacking the head of the whale. Mr. Gay and his two companions were frequently in peril. On one occasion the large whale swam headlong towards their small craft, and the water from the blow-hole in the head of the whale sprayed the occupants of the boat."

Mr. Cotton quotes other references to Killer Whales, including one by Mr. T. P. O. Menzies, Curator of the Scientific Association, City Museum, Vancouver, who supplied his own original paintings of the Indian Killer Whale designs forming the cover design of "The South Australian Naturalist," and which are reproduced by permission as plate xvi. of this journal. Mr. Menzies also supplied a legend he obtained direct from a Haida Indian, and which we reprint:—

"The Haida Indians of the Queen Charlotte Islands and the Prince of Wales Island, a war-like race, might be described as the Vikings of the North Pacific. They had a legend of the 'Killer Whale,' which to them was possessed of the evil spirit, and came from a domain called Het-gwan-ta-na (Lower regions).

"During their seal hunting and halibut fishing expeditions they dreaded to see one of these creatures, as they seemed to delight in pursuing the Haidas and smashing up their canoes. When this happened the Indians were thrown into the sea and drowned. After a period the spirits of the drowned Indians were supposed to enter the Killer Whales and to be controlled by Het-gwan-ta-na.

"Long ago there were two warriors, who started off in their canoe to challenge the Killer Whale. Before long they found themselves surrounded by a big school of Killer Whales, who attacked and badly damaged their canoe. One of the men swore an oath that he would kill as many as he could before he himself was transferred into one. He was drowned, and his companion, clinging to the smashed canoe, was finally blown on to an island and rescued.

"His rescuers searched for the body of his friend; then one evening they heard strange noises as if from beneath the ground. Suddenly they saw large quantities of fish of all descriptions floating up dead, amongst which was a monstrous Killer Whale, dying with a large wound in its belly. The whale finally died, and its body was washed up on the beach. The medicine man of their tribe said 'that he had had a vision and saw the Indian who was drowned attack the chief of the Killer Whales and gave it its death stroke.' In doing this, he became the chief of Killer Whales and lord of Het-gwan-ta-na, the Lower regions."

Mr. Cotton adds that the South Australian Field Naturalist Section would be pleased to hear of any further Australian records of Killers.—[Eds.]

AUSTRALIAN PEARLY NAUTILUS.

By TOM IREDALE.

(Contribution from The Australian Museum, Sydney, N.S.W.)

The Pearly Nautilus, as a relict species of great beauty and form, has always been a source of interest, scientifically, as well as popularly. That more than one species existed has always been admitted, but the exact number of living species has not yet been determined. Up to the present time no living specimen has been secured in Australian waters, though I have been told of some seen off Dunk Island, North Queensland. Mr. Chas. Hedley secured a shell at Murray Island, with remains of muscle scar attachment, while recently Mr. G. P. Whitley picked up a shell at Fraser Island in similar condition. On a stretch of beach below Cape Bedford, North Queensland, I counted over one hundred broken shells, while at the Mission Station, there was a large case full of perfect specimens picked up at various times along this beach within a distance of about one mile. Obviously all these had not drifted hundreds of miles, and it seems certain there is some breeding place in North Queensland. Mr. G. P. Whitley has now sent me a very fine shell from Pelsart Island, Abrolhos Group, Western Australia, which also retains portion of the muscle scar flesh, suggesting there is a breeding place in Western Australia also. This shell is very different from the Queensland ones, and instigated this review. When

Linné named *Nautilus pompilius*, Rumph's illustration is the first one with exact locality agreeing with the locality "In India" vaguely added by Linné, so that the type locality can be fixed as Amboina. Rumph's painting shows a rather small imperforate shell with rather distant banding continuous to edge, some twenty-two or three wrinkly bands.

The North Queensland shells all agree in their somewhat small size, not exceeding 6 inches in diameter, but with the painting very different, only some twelve to fourteen bands clearly separable at periphery, not continuing to edge, and not as wrinkled as in the preceding figure, apparently also of different colour, lake not brown.

The Western Australian specimen collected by Whitley is a much larger shell, eight inches in diameter, still imperforate, but with different banding, the bands being interrupted, and, though some twenty-four in number, they are quite restricted in range, the posterior half of the shell being bandless.

Other Nautiloid species show an umbilical cavity, varying from very small to very large, and there is confusion among these also. Generally, the species with the very large umbilicus is a large shell, and is commonly known as the King Nautilus on this account. The Nautilus, with the medium-sized umbilicus, varies in the nature of that, while there is another with a very small perforation.

It will be best to display these systematically as the names have been confused.

NAUTILUS POMPILIUS, Linné.

Nautilus pompilius Linné, Syst. Nat., x. ed., p. 709, January, 1758. In India.

Rumph's citation being first one determinable with locality, so that Amboina is here selected as type locality.

As most imperforate shells have been classed under this name, its exact range is at present indeterminable, "Eastern Archipelago to Feejees," recorded by Bennett, eighty-five years ago, being accepted by most writers without question. As noted above, the Amboina form appears distinctive, and has not yet been met with in Australian waters.

NAUTILUS ALUMNUS, *sp. nov.*

Nautilus pompilius, of Australian writers, Brazier, Hedley, etc., recording shells from Queensland, drifted specimens from New South Wales.

This differs from the Amboina shell, as above defined, and all the shells seen are in agreement in coloration and design.

There is a record of a living specimen from Yorke's Peninsula, South Australia, A. R. Riddle, Trans. Roy. Soc. South Austr., Vol. xlv., p. 257, 1920, which is not acceptable.

NAUTILUS REPERTUS, *sp. nov.*

Nautilus ambiguus Sowerby, Thes. Conch., Vol. ii., p. 464, pl. xcvi., fig. 2, 1849. No locality given. Not *Nautilus ambiguus* Fichtel & Moll, Test. Micr., 1798, 62 (Sherborn).

Shell large, imperforate, brownish umbilical patch, with white band separating this from the narrow peripheral bands, which are orange brown, separate, only extending on half the shell, the major portion being white.



It will be noted that the coloration and size are of the *Scrobiculatus* style, but this species is imperforate.

The specimen sent by Mr. Whitley from Pelsart Island, Abrolhos, W.A., measures $8\frac{1}{2}$ inches across, the depth $6\frac{1}{2}$ inches, the width of the mouth 4 inches. Mr. Whitley has also forwarded an excellent drawing of a shell, W.A. Mus., Regd. No. 12976, from Rottnest Island, which is here reproduced. It seems even a little larger, the drawing giving a little over 9 inches, 7 inches, $4\frac{1}{5}$ inches respectively, but in every detail it agrees with the specimen in hand.

NAUTILUS STENOMPHALUS, Sowerby.

Nautilus stenomphalus Sowerby, Thes. Conch., Vol. ii., p. 465, pl. xcvi., fig. 3, 1849. No locality given = North Queensland.

This is quite distinct through the occurrence of a small umbilical perforation. Coloration and size similar to that of *N. macromphalus*, umbilicus less than half an inch in diameter, sides steep, umbilical area sloping, coloration lake, peripheral bands separate but tending to merge, not running into umbilicus, leaving a white circumbilical area.

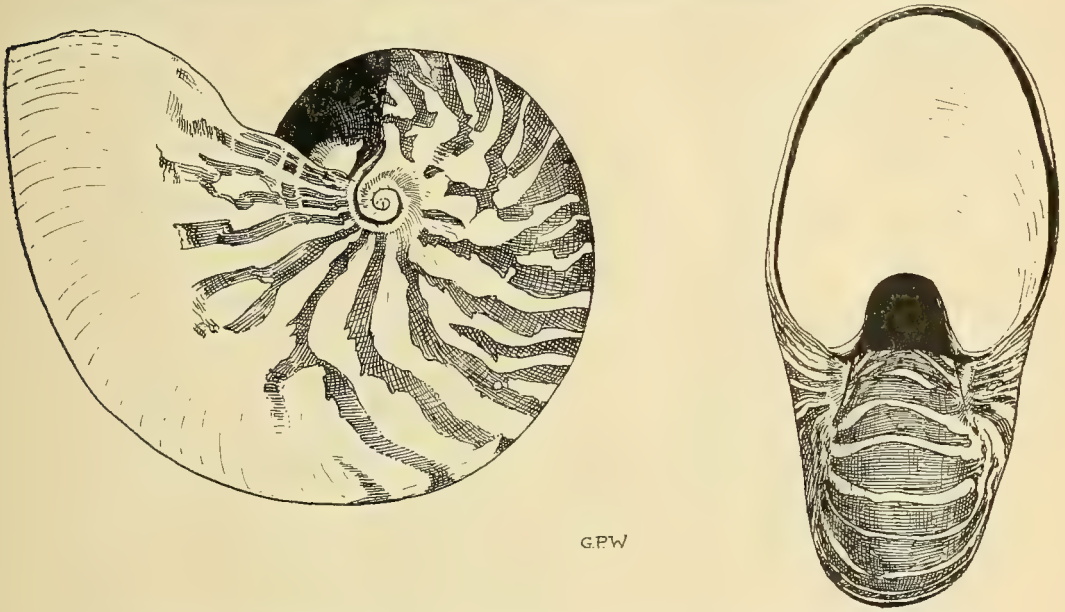
NAUTILUS MACROMPHALUS, Sowerby.

Nautilus macromphalus Sowerby, Thes. Conch., Vol. ii., p. 464, pl. xcvi., figs. 4-5, 1849. No locality = Island of Pines, New Caledonia.

This very distinct form with wide umbilicus was localised by Bennett, the wide umbilicus, less than an inch in diameter, having sloping sides, the colouring being lake, broad bands separate on periphery, running into umbilicus and extending to the mouth but disappearing towards the periphery posteriorly.

Apparently the common New Caledonian species. Shells occur on the Queensland coast not infrequently.

The figure here presented by G. P. Whitley of a Western Australian shell from Geraldton, W.A. Mus., No. 11460, agrees very closely with Sowerby's figure, but autoptical comparison may necessitate separation.



In the Austr. Mus. Mag., Vol. vii., p. 112, 1940, there is a photograph of a Pearly Nautilus brought alive from Maré Island, Loyalty Group, which seems to be of this species.

NAUTILUS SCROBICULATUS, Solander.

Nautilus scrobiculatus Solander, Catalogue Portland Mus., p. 182, ante April 24, 1786. New Guinea, citing Lister, 552, 4, and Knorr, iv., 22, 1. Cf. Proc. Mal. Soc. (Lond.), Vol. xii., p. 90, 1916.

Nautilus umbilicatus Lamarck, Hist. Anim. s. Verteb., Vol. vii., p. 633, 1822. First reference, Lister, Conch., t. 552, fig. 4.

Nautilus umbilicatus "Lister," Sowerby, Thes. Conch., Vol. ii., pl. xcvi., fig. 7, 1849. No locality given. Noted there was a prior *N. umbilicatus* Linné.

Nautilus perforatus Conrad, Journ. Ac. Nat. Sci. Philad., Vol. i., p. 213, 1849. Am. Journ. Conch., Vol. ii., p. 101, 1866.

Nautilus texturatus Gould, Proc. Zool. Soc. (Lond.), 1857, p. 20, June 6; introduced for the Listerian shell, restricting *scrobiculatus* to a smooth one!

This form with the large steep-sided umbilicus and rough surface has been known from the earliest conchological times, being separated in Lister's work, issued in 1685-92. It is immediately recognised through its

roughened surface, but as some are smoother than others, Gould separated two species, but as no localities were known, and he cited Lister's shell his name is invalid. Bennett gave as localities "Solomon Islands, New Georgia, New Britain, and New Ireland," and this form occurs (drifted) in North Queensland.

Shell large, usually larger than *pompilius*, although Lamarck gave the latter as 7 inches 8 lines, a fine sculpture of microscopic concentric wavy lines present, umbilicus broad, over an inch in diameter, the sides steep, colouring deep brownish orange, confluent on periphery, bands, narrow, running into umbilicus, the posterior half of the shell unbanded.

NOTES ON DISTRIBUTION OF AUSTRALIAN FINCHES.

Compiled by A. I. ORMSBY.

(Period: February-November, 1943.)

During the above period I have been on the Atherton Tablelands, between Ravenshoe and Herberton, Queensland, travelling considerably in and around the locality.

As a aviculturist, formerly specialising in finches (I have kept and bred most Australian species), I was naturally on the look-out for field notes. To my surprise, during the whole time I was on the Tableland, I only encountered two species, namely, the Black-rumped Parson Finch, *Poephila atropygialis*, and the Red-browed Finch, *Aegintha temporalis*. The former was quite common in the vicinity of camps, one camper informing me that he was feeding about 40 at the cookhouse. One pair built a nest in an old lemon tree only a few yards from the camp. Unfortunately, owing to a move, I was unable to continue observations. This nest was built in March before the wet season was completely finished. Just as in the aviary, the rough structure was completed in a couple of days. Unlike the former, the Red-browed Finch could be found in large flocks, particularly in low bushes along creeks and watercourses in open country. The Red-browed Finch is the shyer of the two birds, but frankly there are few really "wild" birds on the Tablelands in the sense that they are shy and timid as we see them around Sydney. The finches are all found in open country. I have never found them in jungle or thick wooded country. I am quite convinced that if there were any other species of finch about I would have observed them, particularly on account of their ground feeding, and the tiny trumpet notes of the Zebra could scarcely have eluded me. Incidentally, the Zebra Finch was quite common around Townsville. Could the areas of dense jungle have been a barrier to this and other finches?

Another matter, possibly of interest, was the absence from the Tablelands of the Fairy Wrens, excepting one species, the Red-backed Wren, *Malurus melanocephalus*. This dainty little bird was particularly tame, occasionally coming into the tent, and I have observed them from a range of a few feet. Possibly the same factors operate with this family as with the finches. I never saw these birds in the jungle, and seldom more than a couple of feet from the ground.

THE LAND MOLLUSCA OF LORD HOWE ISLAND.

By TOM IREDALE.

(Plates xvii.-xx.)

(Contribution from The Australian Museum, Sydney, N.S.W.)

Years ago I reported upon the Land Mollusca of the Kermadec Islands, and made contrast with that known from Norfolk and Lord Howe Islands. Later I discussed in more detail the series collected by Roy Bell at Norfolk Island with that of the Kermadec Islands, and anticipated a discussion with material arriving from Lord Howe Island from the same collector, Mr. Roy Bell. Before it is too late an account is here produced, and it has the advantage that in the intervening years I have examined much material, having listed the land shells of Australia and Papua.

The collections made by Roy Bell passed through my hands, and were studied by H. B. Preston, who discriminated and named many genera and species, but the names have not been published, though series were distributed. There is a series of "cotypes" in the Australian Museum, and these have been used for description, the names attached being retained. Much additional material has been available, and the specimens have all been reviewed again and again, and it is certain that this remarkable faunula is not yet completely known, though the present essay records an almost incredible number for such a small island.

Lord Howe Island is situated about 450 miles north-east from Sydney, and is a political appanage of this State, but not by any means a zoological part. It is a small crescent-shaped islet, the small northern ridges rising to 700 odd feet, being separated from the main rocky mass by sandy lowlands, the bulk of the island being the two heights, Mt. Lidgbird, rising to 2,504 feet, and Mt. Gower, 2,840 feet, connected by a saddle some 1,000 feet, from which a deep gully known as the Erskine Valley runs to the western sea. The climate is temperate, and the rainfall good, so that the vegetation is dense.

An excellent account of the history of the island and the zoological collectors has been published by Hindwood in the *Emu*, Vol. xl., July, 1940, and also issued separately, entitled: "The Birds of Lord Howe Island." Although the island was discovered in 1788, none of the earlier visitors apparently collected land shells until Macdonald and Macgillivray called there in the *Herald* in 1852 and 1853. The latter was a brilliant collector and sent his finds to London, where some specimens fell into the hands of Cuming, and hence acquired description. It may be recalled that Macgillivray's collection of Kermadec shells went to the British Museum, and reposed there undisturbed for some sixty years. It may be that part of this Lord Howe Island collection suffered a similar fate, but, anyhow, the collections were confused with those from another Lord Howe Island in the New Hebrides, and the confusion still remains.

Brazier has reported that Macgillivray collected ten species, but this seems to have been surmised, from the published accounts only. Macdonald observed once that he had collected three species of one genus, but did not mention anything further. As noted, these were described in London, but

all the succeeding work appeared in Sydney, through local collectors, Masters, Brazier and Morton, visiting the island in 1869, 1872-73 and 1882 respectively. Then a wave of enthusiasm led to the Australian Museum Expedition of 1887, which resulted in a "Memoir" on the island. It was led by R. Etheridge, Jr., and T. Whitelegge is recorded as the collector of mollusca, seven new species of land shells being added. The Museum continued its interest, Waite, McCulloch, Hedley, North and Hull visiting it between 1900-1910, and since then Troughton, Musgrave, Whitley, Miss Allan and myself have collected there. While specimens have accumulated from these visits, practically no written account has appeared since Hedley recorded the results of the 1887 Expedition.

G. M. Mathews secured the services of Roy Bell, of the Kermadec Islands, for the investigation of the ornithology of Norfolk Island and Lord Howe Island. Roy Bell and I had explored the Kermadecs together, and he collected molluscs on the same system at Norfolk Island, where he made an extraordinary collection. He continued with those of Lord Howe Island, a really wonderful collection, and the basis of this report.

A plate (xvii.) is attached, giving two views of the island, one from the old settlement, looking southward. In the foreground, on the right, lies Goat or Rabbit Island, while the two mountains are clearly seen in the back. The nearest, Mt. Lidgbird, is separated from Mt. Gower, which is higher, by a deep ravine, known as the Erskine Valley, which reaches up about one thousand feet, the height of the connecting saddle between the two mountains. Anywhere, about the saddle, is regarded as the heights, while the "Summit of Mt. Lidgbird" was never reached, until Roy Bell made a track, all previous citations being to low altitudes.

The other view is from the Lower Road, across the base of the wall of Mt. Lidgbird, looking northwards; it takes in all the lagoon: again showing Goat Island, and shows the North Ridge in the distance, the curious peak on the left being known as Mt. Eliza. In between the North Ridge and Mt. Lidgbird is low uneven country, ranging from sea level up to 700 ft., and this is regarded as the Lowlands. An appreciable extent of this lowlands is blown coral sand, sometimes forming coralsand rock. Other localities cited are well-known, locally, though some will not appear on ordinary maps.

Etheridge, Jnr., and Hedley wrote "Ledgbird," but the acknowledged spelling is now "Lidgbird," and this spelling has been used throughout.

My very sincere thanks are here tendered for the excellent drawings made by Miss Joyce Allan, who has recently returned to the Museum, after two years' absence on war duties.

Class GASTROPODA.

Subclass PROSOBRANCHIA.

Order PECTINIBRANCHIA.

Family GEORISSIDAE.

There seems to be no good reason for continuing the association of the Indo-Pacific Georissid forms with the Mediterranean and Atlantic species of *Hydrocena* in a family Hydrocenidae, so the former are here separated as above.

The Lord Howe representative is reported as living on moss on the S.S.E.

side of Mt. Gower, among dry leaves at North Bay, and in crevices of the cliffs half-way up Mt. Lidgebird in dryish places.

Genus *MONTERISSA*, *nov.*

Type, *M. gowerensis*, *nov.*

Similar to the Australian *Omphalorissa*, but the shell lacks spiral sculpture, the pad is restricted to the anterior portion of the inner lip, and the operculum differs, being paucispiral with nucleus small and basal.

MONTERISSA GOWERENSIS, *sp. nov.*

(Plate xviii., fig. 1.)

Shell minute, turbate, brownish yellow, imperforate, whorls four, rounded, sutures deep, last whorl large, mouth oval, outer lip thin, columella slanting, inner lip reflected, as a pad covering the umbilicus at every stage of life. Length, 2.25 mm.; breadth, 1.75 mm.

Family REALIIDAE (OMPHALOTROPIDAE, Olim).

The details concerning this alteration have been given in this Journal (Vol. x., p. 59, December 19, 1941). Species referable occur commonly on this island and Norfolk Island, and are very different in appearance, so that four genera are here distinguished.

Genus *DURITROPIS*, *nov.* Shell small, conical, apical whorls smooth, turbate, later whorls sculptured with longitudinal wavy ribs, suture impressed, whorls convex, strong peripheral keel with pronounced umbilical keel, umbilical area large, umbilicus narrow, operculum paucispiral, horny.

Type, *O. brenchleyi*, Sykes. Norfolk Island.

Genus *TELMOSENA*, *nov.* Shell small, acutely conical (awl-shaped), apical whorls smooth, dome-shaped, later whorls smooth, suture lightly impressed, whorls little convex, no peripheral keel, umbilical keel strong, umbilical area very small, perforation obsolete, operculum normal.

Type, *O. suteri*, Sykes. Norfolk Island.

Genus *OPINORELIA*, *nov.* Shell smaller than preceding, stoutly conical, apical whorls smooth, turbate, a little elevated, later whorls smoothish, with fine concentric threads, suture deep, peripheral keel obsolete on last whorl, but sometimes recognisable on earlier ones, umbilical area large without keel, and only small perforation, operculum normal.

Type, *O. howeinsulae*, *nov.* Lord Howe Island.

Genus *LIMBORELIA*, *nov.* Shell much larger than any of the above, acutely conical, last whorl broad, apical whorls flattened, dome-shaped, smooth, later whorls with very fine spiral threads, suture lightly impressed, whorls little convex, peripheral keel well marked, umbilical area large, bounded by strong keel, umbilicus narrow, operculum paucispiral.

Type, *Hydrocena exquisita* Pfeiffer. Lord Howe Island.

Obviously the two Lord Howe Island forms are quite unlike the two Norfolk Island ones, and indicate different origin and development.

Genus *OPINORELIA*, *supra.*

This puzzling form recalls the succeeding in some ways, but disagrees

in others; the very rounded last whorl without keel, and the lack also of the circumbilical keel, separate it at sight, while the curious sculpture is also distinctive, but the form of the mouth is very similar.

OPINORELIA HOWEINSULAE, *sp. nov.*

(Plate xviii., fig. 2.)

Shell small, conico-turbinate, whorls very rounded, dark brown. Apex of one and a half whorls, smooth, suture canaliculate, adult whorls five with deep sutures, smooth with distant concentric slight fringed striae, the striae interrupted by growth periods, ten striae on penultimate, twenty on last whorl, mouth suboval, outer lip circular, thin, columella short slanting concealing the umbilicus which is very small.

Height, 4 mm.; breadth, 3 mm.

Type locality: The Lowlands, among palm trees.

This seems to be a form of the lowlands, specimens from the top of Mount Lidgbird, being apparently larger and broader, measuring 5.5 mm. by 4.5 mm., and may be called *O. h. belli*, subsp. nov. In some specimens there is a thread running from the anterior end of the inner lip into the umbilicus, but this is not always distinct.

Genus *LIMBORELIA*, *supra*.

The acute spire, flattened whorls, swollen body whorl, keeled periphery, small umbilicus, with circumbilical keel, separate the type widely from the preceding.

LIMBORELIA EXQUISITA, Pfeiffer.

Hydrocena exquisita Pfeiffer, Proc. Zool. Soc. (Lond.), 1854, p. 307, May 8, 1855. Lord Howe Island (McGillivray).

Omphalotropis pfeifferi Crosse, Journ. de Conch., Vol. xvi., p. 178, April 1, 1868. "Lord Howe Island, New Hebrides." Figured, next volume (Vol. xvii.), pl. xii., fig. 7, April 1, 1869.

The descriptions show that these refer to the same species, apparently the incorrect locality misleading Crosse. It is the common Lowland form, and has not been received from the mountain tops, where its place appears to be taken by the succeeding.

LIMBORELIA INNESI, *sp. nov.*

(Plate xviii., fig. 3.)

Shell smaller than the preceding, and easily separated by the shouldered whorls. Shell small, stoutly conical, dark brown, whorls six with one and a half apical whorls, which appear smooth; adult whorls sculptured with very fine close concentric thread lines, suture very deep, each whorl showing a notable shoulder. Peripheral keel pronounced, circumbilical keel present, umbilicus small, half hidden by the columella, which is perpendicular. Height, 4 mm.; breadth, 2.25 mm.

Abundant on Black Face, Mt. Lidgbird.

On the top of Mt. Gower this form occurs, but the shouldering is less pronounced, and the circumbilical keel becomes obsolete. This may be called *L. i. adjuncta* subsp. nov. Specimens from the top of Mt. Lidgbird agree better with this, than with the lower typical form.

It may be noted that Hedley figured (Rec. Austr. Mus., Vol. i., p. 143, pl. xxi., fig. 8, 1891), a shell as *Realia exquisita* (Pfr.), which looks like this, but the shell labelled as original is a smooth unkeeled shell. He used *O. pfeifferi* Crosse, for the true *exquisita*.

Family DIPLOMMATINIDAE.

This family of small operculate snails shows an extraordinary representation, the number of species being abnormal and apparently never-ending. Denis Macdonald reported that he had collected three species in 1852, and Macgillivray, the year later, was credited with four, but this number included two erroneously localised. When the Museum Expedition of 1887 only reported two, Hedley only recorded two, but noted that many varieties apparently existed. Upon examination, the material has yielded seven forms, and about double that number is here recorded as a basis only. There was discussion at the introduction of the first genus, *Diplommata*, as to whether it were operculiferous or not. It seems to have been overlooked that Denis Macdonald definitely stated that some of the Fijian species lacked entirely an operculum. Semper noted that the operculum of Pelew Island species was so small that he had difficulty in finding it, while Gassie's also observed that the New Caledonian species had a very small operculum. In the multitude of Lord Howe Island shells I have handled I have failed to catch sight of a single operculum. Perhaps, as Denis Macdonald concluded, we are here confronted with the anomaly of a non-operculiferous operculate, though the Norfolk Island species have a large notable operculum as he figured in the Ann. Mag. Nat. Hist., Ser. 4, Vol. iv., p. 78, pl. iv., August 1, 1869.

Genus PALAINA, Semper.

In the Journ. de Conch., Vol. xlii., p. 289, July 1, 1865, O. Semper wrote a "Notice preliminaire sur le famille des Diplommatinacées," and on pp. 290-91 recorded that "H. & A. Adams had separated *Arinia* and *Paxillus*, and Martens, *Diancta*." To these he would add a fourth, consisting of a series of new species, and including some from Australia. This group he named *Palaina*, and gave a list of fifteen undescribed new species, and *macgillivrayi* Pfr., and *capillacea* Pfr. The two last are the only ones identifiable, and I designate *macgillivrayi* Pfr., as type of *Palaina*. This is necessary as Thiele, apparently following Kobelt and Mollendorff, has given *patula* Crosse, as example.

The true *Palaina*, as developed on Lord Howe Island, includes sinistral shells, varying from 1.5 mm. to 6 mm. in length, the largest being the typical *macgillivrayi*. The apex is small, turbinate, and smooth, the adult whorls descending rapidly, the juvenile being a conical openly perforate shell, the fourth or fifth whorl ascending a little, closing entirely the umbilical area, and forming a more or less circular mouth with expanded lip closely appressed to the body whorl. Operculum so far not seen, if present at all. A curious feature is the change of sculpture seen on last whorl just above the aperture, where a depression is noted in which the sculpture is much finer than that preceding and succeeding it.

Four species were credited in early accounts, *macgillivrayi*, *capillacea*, *chordata* and *cantori*. The two first-named are undoubtedly native, but the third was described as from New Zealand, collected by Strange, with a variety from Lord Howe Island. The description shows this to be the New South Wales species, collected by Strange, and simultaneously described by

Benson and A. Adams, and nothing much like this occurs on the island. The fourth was named as from Lord Howe Island, New Hebrides, and the description is of a small shell, 2 mm. by 1 mm., with an acute apex, which no local shell possesses, so that it must be looked for at the other Lord Howe Island.

The Norfolk Island forms may be here diagnosed as *PALMATINA*, *gen. nov.* Shell small, up to 3.5 mm., elongate, apex a little elevated, sinistral, sculpture of erect sharp longitudinal lamellae, last whorl completely rounded, aperture circular, almost free, mouth duplicate, operculum circular, large, filling mouth. Type, *D. cori*, H. Adams.

The Lord Howe Island species can be separated into three size groups, large, medium and small to minute. While there may not be any additions to the two first groups, many may be added in the last. The species appear to occur in local colonies, and also restricted in range, so that a great deal of study is still necessary.

PALAINA MACGILLIVRAYI, Pfeiffer.

(Plate xviii., fig. 16.)

Diplommatina macgillivrayi Pfeiffer, Proc. Zool. Soc. (Lond.), 1854, p. 303, May 8, 1855. Lord Howe Island.

Described as measuring 6 mm. by 3 mm., with six whorls, including two apex, the next two distantly costulate, the penultimate very broad, closely costulate, the last whorl very closely costulate. This is a good description of the common Lowlands form. On account of the longitudinal sculpture varying on the whorls, I am giving the number of ribs seen in front view as illustrated, for easy determination. Coloration pink and cream, the latter showing as a band on last whorl. Shell turreted, imperforate, swollen medially, mouth a little irregular, the left side showing a blunt corner, whorls convex, sutures deep, the apex consisting of one and a half whorls smooth, sometimes faintly radially striate, the first adult whorl showing on the face nine lirae, with longitudinal threads between, next whorl twelve, the next fifteen, the last twenty. The juvenile openly perforate, conical, showing spiral concentric striae on the early whorls.

A distinct form is named

P. MACGILLIVRAYI SEMILEVIS, *subsp. nov.*

This may later be determined as specifically separable as in certain localities it only occurs, and when found mixed with the preceding a size-differentiation appears. The specimen figured and described, plate xviii., fig. 12, is from North Bay, whence a uniform series was sent.

Shell large, of same form as the type, but whorls less convex and sutures shallow; the distant lirae of the early whorls disappear on the later whorls, which are very finely striate only. Using the formula above noted, the first whorl and half smooth, the next nine lirae, succeeding nine, the penultimate seven stronger, twenty weak threads, with the last about forty-five.

Common also on the North Ridge, Boat Harbour, and the foot of Mt. Gower.

From the heights of Mt. Gower another form is named

P. MACGILLIVRAYI PUSILLIOR, *subsp. nov.*

This is figured (pl. xviii., fig. 17), and again may prove a distinct species. It is smaller, measuring 4 mm. by 2.5 mm., with more regular, coarser sculpture, whorls convex, sutures deep, not so swollen as the type, the apical one and a half smooth, next ten, third twelve, fourth twelve and last with seven lirae, then twelve fine threads in depression, and five lirae. It may be pointed out that the back of the last whorl shows a succession of close regular fine lirae.

PALAINA CAPILLACEA, Pfeiffer.

(Plate xviii., fig. 8.)

Diplommatina capillacea Pfeiffer, Proc. Zool. Soc. (Lond.), 1854, p. 303, May 8, 1855. Lord Howe Island.

This was described as 5 mm. by 2-2/3rd mm., "capillaceo-striata."

The Lowland shell answering to this description is differently built from the preceding, the whorls increasing more regularly, with no medial swelling. Shell creamy white, rarely pink, turreted, whorls convex, sutures deep, apex of one and a half whorls, dome-shaped, smooth, first adult whorl showing rather distant threads, twelve in number, next with eighteen, third with twenty-two, the last showing nine, the depression very finely threaded, with twelve on right side. The specimen figured is an immature from "Near the Pines, under sticks on ground," but in the adult the mouth is thickened and subcircular.

A series from Goat Island is composed of smaller shells with more numerous but still distinct threads, and may be named

P. CAPILLACEA DEFINITA, *subsp. nov.*

The figured type shell (plate xix, fig. 3) measures 4 mm. by 2 mm., and the first whorl and a half are smooth, a little elevated, the first adult whorl showing fifteen threads, the next twenty-one, the next thirty, the last nine, medially too fine to count easily, right side half a dozen.

This is the first mention in this essay of Goat (or Rabbit) Island as a locality providing local differentiation, but it has a long history, though it is a mere rocky islet on the reef edge of the lagoon. Yet from it has been described *Placostylus cuniculinsulæ* Cox, *Nanina sophiæ* var. *conica* Hedley, and *Helix catletti* Brazier, all of which will be treated later.

PALAINA LEVICOSTULATA, *sp. nov.*

(Plate xviii., fig. 13.)

Recalling *capillacea* in form, but with the whorls less convex and the sutures shallow, the sculpture is completely reduced to a threading so fine that the threads are not worth counting. The apex is very finely radially striate, and the type from the North Ridges measures 5 mm. by 2.5 mm. It is perhaps the second commonest Lowland form, and, while the adult is usually white, the immature is horny in appearance, and does not show the open perforation of *macgillivrayi*, though still perforate. This completes the series of larger shells.

PALAINA NICHOLSAE, *sp. nov.*

(Plate xviii., fig. 9.)

Shell smaller, more regular in form, whorls convex, sutures deep, some-

with the first whorl and a half dome-shaped smooth, next whorl, first what regular lirata throughout. The type measures 3.5 mm. by 1.75 mm., adult, broad with fifteen lirae, next two eighteen to twenty each, last 8 on left, twelve finer in depression, and eight on right, the mouth more circular. Common on the Lowlands, Old Settlement, North Ridge, and also Boat Harbour.

This is probably the form recorded under *chordata*.

PALAINA HOWEINSULAE, *sp. nov.*

(Plate xviii., fig. 10.)

Shell a little larger than the preceding, bulkier in build and with coarser sculpture, mouth larger, less rounded, measuring 4 mm. by 2.25 mm. The first whorl and a half are smooth, forming the dome-shaped apex; next whorl broad but shallow in depth with nine lirae; next ten, third twelve, last with sixteen finer but distinct on depression. Equally common on the Lowlands with the preceding.

PALAINA WATERHOUSEI, *sp. nov.*

(Plate xviii., fig. 11.)

Smaller and pure white, whorls convex, sutures deep, measuring 3 mm. by 1.5 mm. The apex of one and a half whorls, smooth, is very small, almost immersed in the first adult whorl, which is broad, with nine distant lirae between which fine concentric striae can be distinguished; the next whorl has also nine or ten, third with twelve, the last showing twenty finer lirae, the concentric striae being now obsolete, mouth circular.

Near the Pines under sticks, also North Ridge and Boat Harbour. May be widely distributed, but not easily collected on account of small size, which remark applies to all the smallest forms.

PALAINA EDWARDI, *sp. nov.*

(Plate xviii., fig. 14.)

This is a shell of the same size, 3 mm. by 1.5 mm., from Mount Lidgbird, a little different from the preceding in form with coarser sculpture. The smooth apical whorls are not immersed, and the first adult whorl shows only five lirae with concentric striae between, the next only seven, the third ten, and the last fifteen, the mouth circular. A similar looking shell measuring 2.75 mm. by 1.5 mm. shows the same number of lirae on the first two adult whorls, but one or two fewer on the third whorl and more on the last, three or four on the left side, ten finer medial ones, and four or five dextrally. This comes from Boat Harbour, and may be called *P. reta* nov.; it may be a subspecies of a widely spread form, or it may be a distinct species.

PALAINA DELICIOSA, *sp. nov.*

(Plate xviii., fig. 15.)

Shell minute, white, whorls very convex, sutures very deep. The first whorl and a half are dome-shaped, smooth, the first adult whorl very swollen, deep, with twelve weak riblets, next even more swollen with fifteen distant riblets, the interstices concentrically striate, the last five, median depression practically smooth, then five more riblets on the right, mouth circular. Length, 1.5 mm.; breadth, 1 mm.

From near the top of Mt. Lidgbird.

PALAINA PADDA, *sp. nov.*

(Plate xix., fig. 1.)

Shell minute, white, whorls slightly convex, sutures deep. Apical whorl and a half, smooth elevated, first adult twenty close lirae, next twelve more distant, last six lirae, then smoothish depression and five dextral lirae. Mouth circular, spreading on face of body whorl, back of which is regularly lirate. Length, 2 mm.; breadth, 1.1 mm.

From North Ridge.

PALAINA LUCIA, *sp. nov.*

(Plate xix., fig. 2.)

Shell small, red with white band, coloration of largest species, but more regular in form. Apical whorl and a half dome-shaped, smooth, first adult whorl with heavy distant ribs longitudinally, about seven in number on face, next with same number, third with ten, last with six, ten, fine on medial depression, then four dextrally, mouth small, circular, appressed.

Length, 3 mm.; breadth, 1.75 mm.

From top of Mt. Gower.

PALAINA EMBRA, *sp. nov.*

(Plate xix., fig. 4.)

Shell minute, white, regular in form, finely sculptured. Apical whorl and a half, dome-shaped, smooth, next three swollen of about same width. On face of first adult whorl, twelve to fourteen ribs may be counted, next eighteen to twenty, last five or six, smoothish medial depression, then dextrally half a dozen, mouth small, circular, appressed to body of preceding whorl.

Length, 1.5 mm.; breadth, .75 mm.

From top of Mt. Gower.

Subclass PULMONATA.

Order STYLOMMATOPHORA.

Family ELASMATINIDAE.

Genus ELASMIAS, Pilsbry.

Elasmias Pilsbry, *Nautilus*, Vol. xxiii., p. 122, March, 1910.

Orthotype, *Tornatellina aperta*, Pease.

ELASMIAS SCHOLA, *sp. nov.*

(Plate xviii., fig. 5.)

Hedley misidentified this species as Brazier's *Tornatellina inconspicua*, and determined my Kermadec Island specimens as identical, and I used the name in my report. I sent my shells with my notes to Pilsbry, who was monographing the family. Pilsbry introduced the generic name, and admitted many species, including as Polynesian,

E. ovatum Anton. Opara = Austral Group. Size, $3\frac{1}{2}$ mm. by $2\frac{1}{2}$ mm.

E. ovatum apertum Pease. Tahiti. Size, $3\frac{1}{2}$ mm. by $2\frac{1}{2}$ mm.

Thereunder he ranked the Kermadec shells, without differentiation, figuring a specimen, 4.5 mm. by 2.6 mm. on pl. 30, figs. 4-5.

E. peaseanum Garrett. Society Islands. Size, 5 mm. by $2\frac{1}{2}$ mm.

From Australia, New Guinea and New Caledonia Pilsbry catalogued
E. wakefieldae Cox. Clarence River, N.S.W. Size, 2.5 mm. by 2.1 mm.
E. mariei Crosse. New Caledonia. Size, 2.5 mm. by 2 mm.

Obviously the Kermadec shell should have been named, as it was larger and differently shaped, so it is here called *E. connisum*, sp. nov.

The Lord Howe Island specimens are large, measuring 3.5 mm. by 2.75 mm., not as large as the Kermadec species, but much larger than the New Caledonian *E. mariei*, which seems juvenile, but the juvenile of the Lord Howe Island species of the same height, 2.5 mm., is broader, with a weaker parietal and more acute columellar teeth. The shell is horny in coloration. On Lord Howe Island specimens were only found on leaves of trees near the school-house, and at the Kermadecs the genus was only found on Kawa (Pepper) plants near a deserted cultivation. As it seems to be found in similar situations throughout its range, this fact suggests that it is a vagrant.

Genus *TORNELASMIAS*, nov.

Type, *T. capricorni*, nov.

The genus *Tornatellinops* was introduced for elongate species with a sinuate columella, but bearing no columellar tooth at any stage of growth. The Lord Howe Island species are very similar in the adult stage, but the juveniles show columellar teeth. This would place them nearer *Elasmatina*, but they cannot be placed under that genus.

TORNELASMIAS CAPRICORNI, sp. nov.

(Plate xviii., figs. 6, 6a.)

Shell elongate, very small, imperforate, whorls slightly convex, sutures little impressed, mouth small, outer lip thin, columella twisted, coloration brown. Whorls five and a half, the apex a little conical, sculpture of radial growth lines only. The very juvenile figured (fig. 6a) shows a columellar tooth.

Length of adult, 4 mm.; breadth, 1.5 mm.

Goat (or Rabbit) Island.

TORNELASMIAS INCONSPICUUM, Brazier.

(Plate xviii., fig. 7.)

Tornatellina inconspicua Brazier, Proc. Zool. Soc. (Lond.), 1872, p. 619, November 3. Lord Howe Island (Coll. Australian Museum, collected by G. Masters).

The original description was copied by Pilsbry and placed under *Tornatellinops*, with reservation, as the type was destroyed and the juvenile stages unknown. Length, 1 line by $\frac{1}{2}$ line; aperture: length, $\frac{1}{2}$ line.

Bell collected a series from crevices of wood near the Pines on the Lowlands, and this is regarded as the lost species and figured as such. It agrees in dimensions and juveniles show a columellar tooth.

TORNELASMIAS LIDGBIRDENSE, sp. nov.

(Plate xviii., fig. 4.)

Shell imperforate, comparatively broader than the Lowland forms, and the juveniles show the columellar tooth to a later stage more noticeably. The whorls are five, the apex more sharply dome-shaped, the whorls more

convex, sutures deeper than in preceding. The parietal is much more prominent, and the twisted columella shows a duplex toothing at some stages, which is puzzling at first. The type measures 3.25 mm. by 1.75 mm., but larger specimens occur at some places. Collected on the Black Face of Mount Lidgbird, and elsewhere in the heights.

Family PLACOSTYLIDAE.

Genus PLACOSTYLUS.

Placostylus Beck, Index Mollus, p. 57, 1837. Haplotype, *P. bootis*, Menke.

Based on a New Caledonian shell, this genus and family is well developed in that island, but the Lord Howe Island species, first-named, is very like the type of the genus in detail. Three forms have been named and, had they come from different places, they might have been placed in different genera so unlike at first sight they appear.

PLACOSTYLUS BIVARICOSUS, Gaskoin.

Bulimus bivaricosus Gaskoin, Proc. Zool. Soc. (Lond.), 1854, p. 152, Moll., pl. xxix., figs. 4-5, April 11, 1855. Lord Howe Island.

This fine shell, apparently collected by J. Macgillivray, measured 2-3/10th in. by 1 in., reddish in colour, with a heavy lipped mouth. Later, a small form with a thin lipped mouth, measuring 1.65 in. by .75 in. from Rabbit (or Goat) Island, was named as a distinct species, *cuniculinsulae*. The Museum Expedition of 1887 collected specimens, including subfossils, and Etheridge named the latter as var. *solida*, but a very large form, with a thin lip, was figured on plate v., figs. 1, 2, 7, 8, under the name *Bulimus* (*Eurytus*) *etheridgei* Brazier. This was not mentioned in the text. The figures measure 65-70 mm. by 27-29 mm., and show the outer lip thin and the inner lip only slightly thickened.

Hedley gives its coloration as "nearly black," and its locality "under the wall of Mt. Lidgbird," reducing it to a variety only of the typical *bivaricosus* of which he gave the radula formula as 127 x 35.22.1.22.35.

The variation in this group is worthy of study, but there is the new difficulty of recent years, the destruction effected by the rat plague, written up by Hindwood. At the present time the various forms may be less visible in the field than in Roy Bell's time, when he indicated no less than six different colonies, separable in the field. The most spectacular was the large form found on the Little Slope of Mt. Gower, which was named *royi*, but which is very close to *etheridgei*, apparently from the saddle of Mt. Lidgbird. This (*royi*) ranges larger than *etheridgei*, 80 mm. by 40 mm., against *etheridgei*'s 65 mm. by 27 mm., and differs in the red-brown coloration, the thickened lips, and the locality, Little Slope of Mt. Gower. Apparently the colonies breed true, and the immature are separable, according to Roy Bell's account and series, which he forwarded.

A small form from the mainland recalling *cuniculinsulae*, but with a thickened mouth, the dead equivalent of *solida*, was named *belli*, as the specimen measures 56 mm. by 23 mm., the apex large, dead shell white, no ripple markings, only rough growth lines, mouth thickened, outer lip showing weak posterior notch and deep anterior sub-channel, columella twist strong, inner lip heavily callused. Although Pilsbry wrote for the type of *Placostylus*, "embryonic whorls thimble punctate," this is not so in this group, as the juvenile consists of three whorls, wrinkly striate sculpture,

with columella folded. The apex of the N.Z. *shongii* has fine lines regularly, not wrinkly, striate.

PLACOSTYLUS CUNICULINSULAE, COX.

Bulimus (*Placostylus*) *cuniculinsulae* Cox, Proc. Zool. Soc. (Lond.), 1872, p. 19, pl. iv., fig. 3, June. Rabbit Island, near Lord Howe Island.

The name was written *cuniculoides*, in the Museum Report (a curious slip).

This slight shell measured 42 mm. by 20 mm., and the mouth is not thickened at all, a somewhat remarkable evolution.

Family PARALAOMIDAE.

The minute shells belonging to this family appear to be widely spread throughout Australia, and many species are here introduced from Lord Howe Island, some very like the Kermadec typical species. While most are referable to the original *Paralaoma* type, some differ in form and sculpture, and these have been referred to *Allenella*, a genus defined hereafter.

Genus PARALAOMA, Iredale.

Paralaoma Iredale, Proc. Mal. Soc. (Lond.), Vol. x., p. 380, September, 1913. Haplotype, *Paralaoma raoulensis*, Iredale.

PARALAOMA ROYI, *sp. nov.*

(Plate xix., fig. 7.)

Shell minute, depressedly turbinate, spire a little elevated, whorls few, rounded, sutures impressed, widely umbilicate, mouth subcircular, lip thin, columella slightly reflected. Coloration pale brown. Apex one and a half whorls, smooth. Sculpture of dense fine riblets, distinct. Breadth, 1.5 by .75 mm. From near the Pines on the Lowlands. Some shells go larger, reaching 2 by 1.25 mm., the last whorl descending a little.

PARALAOMA INNESI, *sp. nov.*

(Plate xix., fig. 11.)

Shell minute, depressedly turbinate, whorls rounded, sutures deep, widely umbilicate, columella straight, mouth squarish, lip thin. Coloration dark fawn. Apex of one and a half whorls, smooth. Sculpture of fine distinct radials very closely packed. Umbilicus wide, but narrower than in preceding, which occupies about one-third of the breadth of the whorl, and this only one-fifth. Breadth, 1.75 mm.; height, .75 mm. Heights of Mt. Lidgbird.

PARALAOMA COMPAR, *sp. nov.*

(Plate xix., fig. 13.)

Shell small, depressedly turbinate, whorls rounded, sutures deep, umbilicus broad, columella slanting, reflected, mouth roundish. Coloration blackish brown. Apex large, smoothish. Sculpture of strong radials with fine concentric striae between, the latter more noticeable on the base. Umbilicus wide, about one-fifth the width of the base, which is rounded. Breadth, 2.5 mm.; height, 1 mm. Heights of Mt. Lidgbird.

The same, or an allied form, also occurs on the top of Mt. Gower.

PARALAOMA GOWERI, *sp. nov.*

Shell minute, depressedly turbinate, whorls rounded, sutures impressed,

spire a little elevated, umbilicus broad, columella slanting, reflected, mouth large, rounded, as high as broad, lip thin. Coloration brown. Apex large, smooth. Sculpture of fine radial threads, close together but distinct, a very slight concentric striation seen on the base. Umbilicus broad, but only about one-fifth of the breadth of the shell. Breadth, 1.75 mm.; height, 1 mm. Mt. Gower on the heights.

PARALAOMA LIDGBIRDENSIS, sp. nov.

(Plate xix., fig. 12.)

Shell minute, depressedly turbinate, spire a little elevated, whorls rounded, sutures well marked, periphery lightly keeled, columella a little sloping, reflected, mouth broader than high, lip thin, umbilicus very small. Coloration pale fawn. Apex large, smooth. Sculpture of very fine radials, separate and distinct, with a still finer interstitial concentric striation, better seen on the base. Breadth, 1.75 mm.; height, .75 mm. Mt. Lidgbird, near the top.

This minute species is not a typical *Paralaoma*, neither is it an *Allenella*, as the apex is smooth, and the umbilicus is even smaller, while the sculpture recalls that of *Paralaoma*, a new subgenus, *Semilaoma*, with *P. abjecta* Iredale, as type, is therefore introduced.

PARALAOMA ABJECTA, sp. nov.

(Plate xix., fig. 10.)

Very like the preceding in most details, the sculpture finer, no concentric striation notable, spire a little more elevated, mouth a little more rounded, scarcely any broader than high, the keel more pronounced, especially on the earlier whorls. Coloration pale greenish. Breadth, 1.5 mm.; height, .75 mm. Type from Transit Hill. A large series from near the Pines.

Genus *ALLENELLA, nov.*

Type, *A. formalis, nov.*

Distinctive in form, more conical than preceding, with different sculpture, small umbilicus, and apical whorls spirally striate.

This may not be accurately referable to this family, and I was inclined to suggest that anatomical investigation would settle the matter, but after study of many anatomical papers, I am fain to deny that they can help much when they have no assistance from shell characters.

ALLENELLA FORMALIS, sp. nov.

(Plate xix., fig. 9.)

Shell small, conico-turbinate, spire elevated, whorls only slightly rounded, sutures lightly impressed, periphery keeled, base rounded, umbilicus small, deep, mouth large, subcircular, lip thin, columella straight, reflected. Coloration rich brown. Apex of one and a half whorls spirally striate. Sculpture of very fine, microscopic, radial striae faintly decussate by concentric microstriation, these more prominent on the base, the radials there obsolete. Umbilicus small, about one-seventh diameter of base. Height, 2.75 mm.; breadth, 3.5 mm. Heights of Mt. Lidgbird.

A specimen from Mutton Bird Point, on the Lowlands, measures 3.25 in breadth by 2.5 mm. in height, and is more finely sculptured above and

more notably concentrically striate below, representing a new subspecies, *A. f. planorum*, subsp. nov.

ALLENELLA BELLI, sp. nov.

(Plate xix., fig. 5.)

Shell small, depressedly turbate, spire little elevated, whorls rounded, sutures deep, periphery rounded, umbilicus small deep, mouth large, high as broad, columella reflected. Coloration dark brown. Apex of one and a half whorls, spirally striate. Sculpture of very fine radial striae, the decussation scarcely notable, though present, and the radials continue on to the base, with the concentric striae still more obsolete. Breadth, 2.5 mm.; height, 1 mm. Heights of Mt. Gower.

A larger form, 3.25 mm. by 1.5 mm., from the heights of Mt. Lidgbird, is more elevated, subkeeled, sculpture of radials stronger, more pronounced on the base, and may be called *A. b. extra* subsp. nov., and is figured, pl. xix., fig. 6.

Family PSEUDOCAROPIDAE.

An extraordinary development of beautiful small shells is indicated by this family name. When the first members were discovered they were introduced under *Helix*, but were figured as *Helix (Rhytida)*. This indicates the Rhytidoid appearance. When Hedley examined the animals he transferred them to *Patula*, the name then used for "Endodonts" in the widest sense. Obviously they have little real relationship with true "Endodonts," and I was thinking of allotting them to the Flammulinidae, which they slightly resemble. The type, *Flammulina*, is however just as different, so that to save further confusion the above name is utilised.

Shells more or less loosely coiled, whorls few, last very large, sculpture of apex radials, adult sculpture radial ribs, mouth transverse, large. The typical *Pseudocharopa* agrees least with the general description given. An intricate maze of illustration, definition and nomination surrounds the species, and the history must be given.

The first account is by Etheridge (p. 26): "On the eastern flanks and spurs of Mount Lidgbird we collected a small *Helix*, at a height of 800-900 ft., which Mr. Brazier proposes to call *Helix Lidgbirdi*. It is a pretty little turreted and variegated shell, and may be found crawling on the basaltic boulders and blocks strewn over the flanks of this inaccessible hill, but in dry weather it takes refuge in the large vesicular cavities of the basalt." A couple of paragraphs later, the text reads: "The humid gullies and moist hill flanks, running from the North Ridge to the Old Settlement, afforded a prolific hunting ground. There, amid loam, decaying wood, and under stones, were obtained numbers of small *Helices*, which Mr. Brazier proposes to designate *H. Whiteleggei*; a very finely but regularly transversely striated species, *H. Balli*, a rare form."

Such is the introduction of the names, and at this place *H. lidgbirdi* is a recognisable form, *H. whiteleggei* is a *nomen nudum*, and *H. balli* may be later determined. Now to complicate matters plates were included purporting to give illustrations of these species, and unfortunately the crude lithographic attempts were reversed.

Plate iv., figs. 19, 20, are named *Helix (Rhytida) Lidgbirdi* Brazier, and these show the upper and underside only, of a striated unicolor shell,

measuring 18 mm. across. These obviously do not refer to the shell above described.

Plate iv., figs. 23, 24, 25, named *Helix (Rhytida) Whiteleggei* Brazier, are of a large variegated shell, an elevated spire, marked radial striae, small umbilicus, rounded mouth, not entire, shell measuring 11 mm. by 7 mm. The shell so named to-day has a flattened spire not much like this figure.

Plate iv., figs. 13, 14, 26, named *Helix (Rhytida) Balli* Brazier. This is a smaller shell with a higher spire, coarser sculpture, free mouth, unicolor, measuring 8.5 mm. by 6 mm. These figures are nothing like the shell so-called to-day, but agree better in form, but not in colour, with the description of *lidgbirdi*. It should be noted that the locality given for the last two is the North Ridge.

Hedley a little later wrote up the Museum Expedition material, using Brazier's names, with the generic name *Patula*, and giving descriptions, but did not offer further illustrations. Unskilled in conchological work at that date, being more interested in anatomical details, Hedley reduced the three species to one, selecting the name *whiteleggei*, and recording the others, *balli* and *lidgbirdi*, as varieties only. The localities were amended (?) to "Summit of Mount Lidgbird" for *whiteleggei* and *balli*, and "western" flanks of the same mountain for *lidgbirdi*. The members of the Expedition did not reach the summit of Mt. Lidgbird, only attaining the low saddle, while "eastern" not "western" flanks were given for *lidgbirdi*. Then, *whiteleggei* is described as chestnut painted with zigzag flames, measuring 16 mm. by 6 mm., *balli*, no colour given, 11 mm. by 6 mm., and *lidgbirdi*, no colour given, globosely conoid, spire elevated, aperture subcircular, measuring 8 mm. by 6 mm.

The following year Pilsbry copied the figures, reversing them, so that they showed correctly, but added a new figure from a specimen, sent by Dr. Cox, of *whiteleggei*.

Some years ago Peile examined the material at the British Museum, and made comments which are not of much value, as he was more interested in radulae than in shells. He accepted the names as of Hedley, and added a fourth species, ex Preston MS., and proposed the new generic name, *Pseudocharopa*, with *lidgbirdi* Hedley, as type, rejecting Preston's *Howeinsulea* (sic), and nominating *lidgbirdi* as its type (which was not Preston's idea at all).

After discussing vaguely some Lord Howe Island shells, Peile wrote: "I propose for some of these forms the name *Pseudocharopa* gen. nov., in which the shells are perforate with rapidly increasing whorls sculptured with more or less prominent radial costae with fine radial striae in the intervals. Species: *lidgbirdi* Hedley, genotype (pl. XVIIB, fig. 1); *balli* Hedley (pl. XVIIB, fig. 2); *whiteleggei* Hedley, and *exquisita* described below." From a superficial examination of the radulae Peile suggested *Monomphalus*, a very unlike New Caledonian shell, as perhaps related, and apparently he would include "*Endodonta*" *waterhousiae* Hedley, in the medley. He wrote: "The apical sculpture of these shells requires investigation. *Monomphalus* has very minute spirals on the first whorl, so has *E. waterhousiae*, fide Hedley. I have been unable to find spirals in specimens available of other species, probably because of erosion."

What is meant by "other species" is problematical. He explained: "I have examined radulae of *balli* and *lidgbirdi*, and find them in good agree-

ment with Hedley's figure of *whiteleggei*. The formula of the former is 27.1.27."

Then he figured the radula of *exquisita* with formula 21.1.21.

We are now confronted with the usage of the names already proposed, and there are four distinct series, and it is now impossible to determine exactly all the shells mentioned in Etheridge's report. *H. lidgbirdi* is the only one that can be exactly determined, as a shell answering to the description is common at the locality indicated. However, the illustrations in the Report under this name are not referable, the figures allotted to *balli* having been drawn from specimens of *lidgbirdi*, and Hedley's description also applies.

H. whiteleggei, fully described by Hedley and figured by Pilsbry, is the well-known *whiteleggei*, but it does not agree with the figures in the Museum Report, which however are crude, but Etheridge did not describe it. Then Hedley's locality is quite wrong, and Etheridge's should be right.

As to *H. balli*, this seems quite indeterminable from Etheridge's account and figures, and Hedley's reference again to the "Summit of Mt. Lidgbird" does not help matters, so this name should be discarded entirely. It may be noted that Peile's figure, named *balli*, is of a shell from the mountain heights, the top of Mt. Gower, which the Museum Expedition did not reach, and was named *imperator*. More collecting must be done to find out if "*whiteleggei*" and "*balli*" exist on the North Ridge. The above recapitulation is necessary, but whether it will be studied by extralimital workers is very doubtful, as most recent incursions into Australian conchology by such have been notable for their lack of contemporary local literature.

GENUS PSEUDOCHAROPA, Peile.

Pseudocharopa Peile, Proc. Mal. Soc. (Lond.), Vol. xviii., p. 267, November 15, 1929. Orthotype, *Helix lidgbirdi*, Hedley.

Howeinsulea Peile, *ibid.*, same type, ex Preston MS.

As introduced by Peile for "some species" naming four, with "*lidgbirdi* Hedley" designated as type, it was based on radular characters, shell characters being subordinate, yet he did not give any details of the radula of the selected type. His grouping was very general as each species differs.

The type, *lidgbirdi*, as here accepted is the smallest of the series he named, the most elevated, the whorls most convex and the mouth almost circular and free. The radula formula was not given.

The largest species, figured as *whiteleggei* by Pilsbry, has the spire flattened, the whorls little convex showing a slight depression above the periphery, the mouth very large and oval, broader than high and quite discontinuous. The radula formula was given by Hedley as 150 x 21.10.1.10.21. Obviously this does not agree completely with the preceding, and the subgeneric name *Deceptrena* is introduced, with *editor* infra as type.

Next in size is the species figured by Peile as "*balli*," but which was named *imperator* from the top of Mt. Gower. The spire is convex, the whorls flattened, showing no anteperipheral depression, the mouth large, less expanded than the preceding, deeper, discontinuous, sculpture finer, with radula formula according to Peile of 27.1.27, but no details given, and represents another subgenus, *Ballena*, nov., with *imperator* as type.

All the preceding are more or less loosely coiled, showing an open umbilicus, with the apex smooth to radially striate and radial costae more or less strong. The fourth, named *exquisita* by Peile, is very different, and is separated generically as *Lidgbirdia*, gen. nov. The shell is smaller than the previous two, whorls a little convex, spire a little elevated, sculpture very strong of distant radials, weaker threads between, a deep antepерipheral depression, the mouth large, the umbilicus practically missing, being minute and concealed at every stage of growth. The radula formula, according to Peile, is 21.1.21, a crude figure being given.

PSEUDOCAROPA LIDGBIRDI, Etheridge.

Helix lidgbirdi Etheridge, Aust. Mus. Mem. No. 2, p. 26, May 1, 1889, ex Brazier MS. Eastern flanks of Mt. Lidgbird, 800-900 ft. Not pl. iv., figs. 19, 20, but probably figs. 13, 14, 26, under name *H. balli*.

Patula whiteleggei var. *lidgbirdi* Hedley, Rec. Austr. Mus., Vol. i., p. 139, June 30, 1891. "The western flanks of Mt. Lidgbird."

Pseudocaropa lidgbirdi Peile, Proc. Mal. Soc. (Lond.), Vol. xviii., p. 267, pl. xvii.B., fig. 3, November 15, 1929. Lord Howe Island.

Shell small, elevated, loosely coiled, whorls very convex, sutures deep, mouth almost circular, almost free, widely umbilicate. Coloration dull grey, flame-marked with brown. The apex is elevated, one and a quarter whorls, the first whorl practically smooth, developing radials, which are more definite on the succeeding quarter, where a slight varix separates the protoconch from the adult whorls. The sculpture on these consists of distant radial ribs; the interstices longitudinally striate, twenty-five on first whorl, and only slightly packing up towards aperture. Breadth, 8 mm.; height, 6 mm. On the face of Mt. Lidgbird, 800 ft.

On the top of Mt. Gower a larger representative occurs, which is called *gowerensis*, measuring 10 mm. in breadth by 7.5 mm. in height, which is figured (Plate xx., fig. 11). In this the sculpture becomes finer, but never as fine as the succeeding *imperator*, and retains the almost free mouth and the dull coloration.

PSEUDOCAROPA WHITELEGGEI, Brazier.

Helix whiteleggei Etheridge, Austr. Mus. Mem. No. 2, p. 26, May 1, 1889, ex Brazier MS. *Nomen nudum*. North Ridge.

Helix (Rhytida) whiteleggei Brazier, *ibid.*, pl. iv., figs. 23, 24, 25. No exact locality given.

Patula whiteleggei Hedley, Rec. Austr. Mus., Vol. i., p. 138, pl. xxi., fig. 6 (jaw), pl. xxii., fig. 1 (radula), June 30, 1891. Summit of Mt. Lidgbird.

Patula whiteleggei Pilsbry, Man. Monch. (Tryon), Ser. 2, Vol. viii., p. 106, pl. 19, figs. 53, 55, 1892. (Original from Cox specimen.) Lord Howe Island.

Hedley's excellent description and Pilsbry's figure would fix this species, though Hedley's "Summit of Mt. Lidgbird" was quite erroneous.

Shell largest of the series, flattened, spire depressed, whorls little convex, last whorl showing a slight antepерipheral depression, sutures impressed, last whorl disproportionally large, scarcely descending, mouth irregularly transversely oval, lip thin, columella a little expanded, connected by very slight glaze across body whorl, but mouth quite discontinuous.

Coloration, dull greyish with broad dark red brown flames, which soon merge so that the appearance becomes a uniform dull brown with the early whorl only bicolour. Protoconch very similar in every detail to that of the preceding; the adult sculpture consists of radial ribs a little distant on first whorl about thirty in number, interstices radially striate, last whorl completely closely radially striate. Umbilicus open but narrow. Breadth, 16 mm.; height, 6 mm.

Ranges from a few hundred feet up Mt. Lidgbird to top, and probably elsewhere at similar heights. Shells from the top of Mt. Gower do not seem to reach the same dimensions, measuring 13 mm. by 6 mm. In view of the extraordinary confusion about the name and locality, this is here named *editor* nov., and figured. (Plate xx., fig. 1.)

PSEUDOCHAROPA IMPERATOR, *sp. nov.*

(Plate xx., fig. 4.)

? *Patula whiteleggei* var. *balli* Hedley, Rec. Austr. Mus., Vol. i., p. 139, June 30, 1891. Summit of Mt. Lidgbird (erroneously). Not *Helix balli* Etheridge, Aust. Mus. Mem. No. 2, p. 26, May 1, 1889, ex Brazier MS. North Ridge. Indeterminate. Not *Helix (Rhytida) balli* Brazier, *ibid.*, pl. iv., figs. 13, 14, 26, which are *lidgbirdi*, probably figs. 19, 20 (*lidgbirdi*), which are unrecognisable.

Pseudocharopa balli Peile, Proc. Mal. Soc. (Lond.), Vol. xviii., p. 267, pl. xvii.B., fig. 2.

This beautiful species is more brightly coloured than any of the others. Shell a little smaller than the preceding, but spire a little elevated, whorls little convex, sutures impressed, last whorl large, descending, three whorls, outer lip thin, mouth large, discontinuous, oval, a little broader than high, columella straight, a little expanded, umbilicus narrow, open. Protoconch similar to that of the preceding, adult sculpture of fine thread-like radials continuing throughout the same strength to the aperture. Coloration yellowish flamed with bright red, shell seeming more liable to erosion than preceding. Breadth, 13 mm.; height, 9 mm. From the top of Mt. Gower.

In this case specimens from the top of Mt. Lidgbird are smaller, 10.5 by 6 mm., and may be called *P. i. monta*, subsp. nov.

GENUS LIDGBIRDIA, *nov.*

Type, *Pseudocharopa exquisita*, Peile.

Shell differing at sight from any of the preceding members of the family in its form, sculpture and lack of open umbilicus. The intriguing feature of the shell is the medial depression in the upper whorls, while the closing of the umbilicus is characteristic, combined with the strong sculpture continuous to the edge of the mouth.

LIDGBIRDIA EXQUISITA, Peile.

Pseudocharopa exquisita Peile, Proc. Mal. Soc. (Lond.), Vol. xviii., p. 267, pl. xvii.B., fig. 3, November 15, 1929. Near summit of Mt. Lidgbird, on wet rock faces, Lord Howe Island.

Shell small, depressedly turbinate, whorls convex with a medial depression, sculpture of strong distant radial with fine radials between, mouth very large, lip thin, columella slanting, reflected, concealing the minute umbilicus. Coloration dull yellowish grey, flamed regularly with broad zig-

zag reddish brown flames. Apical whorls smooth, variced, first adult with 16-18 evenly spaced ribs, last whorl with about twenty-five.

Genus *MYSTIVAGOR*, *nov.*

Type, ? *Simpulopsis mastersi*, Brazier.

This strange little shell is mysterious enough, but not sufficient to allow it to remain under *Simpulopsis* Beck, an unlike shell from a very remote locality.

It is very small and, as the animal is unknown, it is not certain where it should be located. From shell characters it may be a bulimoid ally of (say) *Pseudocharopa*, and may be living on trees.

Shell small, bulimoid, imperforate, three whorled, last very large, apical whorl finely radially striate, next radially distantly ribbed, third practically smooth. Coloration dull yellowish closely flamed with narrow brown zig-zag flames. Mouth large, oval, much higher than broad, lip thin, columella reflected, inner lip glaze crossing body whorl.

MYSTIVAGOR MASTERSI, Brazier.

? *Simpulopsis mastersi* Brazier, Proc. Zool. Soc. (Lond.), 1872, p. 619, November 3. Lord Howe Island. Coll. G. Masters.

Simpulosis (?) *mastersi* Hedley, Rec. Austr. Mus., Vol. i. p. 141, pl. xxi., fig. 9, June, 1891. A gully on the North Ridge, among dead leaves, rare.

The type measured $3\frac{1}{4}$ by $2\frac{1}{4}$ lines, aperture $2\frac{1}{4}$ by $1\frac{3}{4}$ line. Roy Bell sent a few specimens from the heights of Mt. Lidgbird. Series is necessary to determine if there be any altitudinal variation.

Family *HEDLEYOCONCHIDAE*.

As evidencing the incompleteness of this essay, from amongst a lot of shells from the top of Mt. Gower, two dead specimens were sorted out of a shell apparently closely allied to the Australian *Hedleyoconcha*. The Australian shells live on trees, so that may be the habitat of this species, as tree-living snails are very difficult to observe in dense dark country.

Genus *HEDLEYOCONCHA*, Pilsbry.

Hedleyoconcha Pilsbry, Man. Conch. (Tryon), Ser. ii., Vol. ix., p. 18, November 16, 1893. Orthotype, *Helix delta* Pfeiffer. (South Queensland.)

Shell conical, elevated, whorls little convex, periphery strongly keeled, base rounded, mouth quadrangular, perforate, columella a little reflected concealing umbilicus. The shells found at the island agree very well save for the wider open umbilicus; the sculpture is also weaker but seems of the same nature. This is an extraordinary find as hitherto *Hedleyoconcha* has only been known from South Queensland and New South Wales near the coast.

HEDLEYOCONCHA ADDITA, *sp. nov.*

(Plate xix., fig. 19.)

Shell small, conical, whorls little convex, periphery strongly keeled, base rounded, mouth quadrangular, lower edge rounded, lip thin, columella straight, reflected, umbilicus open, narrow, about one-seventh diameter of base. Coloration ? brownish (dead) white. Sculpture of very fine concentric striae decussated by growth lines. Umbilicus narrow, deep, open.

Breadth, 7.5 mm.; height, 6 mm. Found dead on top of Mt. Gower; from habits of continental allies may live on tree trunks.

Family CHAROPIDAE.

While checking this back, I noted that Etheridge reported (p. 26): "We failed to rediscover *H. textrix* Pfr., and *H. cimex* Pfr." But Hedley recorded many specimens of the former, and it is suggested that these are the shells recorded as *H. whiteleggei* by Etheridge, and the later recognition of their identity as *textrix* caused the transference of the name *whiteleggei* to the *Pseudocharopa*. However, true Charopids occur on the island, one a very handsome shell, and others more obscure.

Genus GOWEROCONCHA, nov.

Type, *G. wilsoni*, nov.

Shell large, discoidal, widely umbilicate, mouth subcircular, sculpture regular, radial ribs, interstices radially threaded, apical whorls radially striate, sometimes appearing, at others the radials are strong, spire a little sunken, mouth subcircular, lip thin.

The type selected is the mountain large species, as *pinicola* is involved with *waterhousiae* in a matter of identity, *fide* Peile, and there is no question of the exclusion of the large *wilsoni*.

GOWEROCONCHA WATERHOUSIAE, Hedley.

Endodonta waterhousiae Hedley, Rec. Austr. Mus., Vol. iii., p. 45, pl. xi., figs. 7-9, 13-14, August 5, 1897. Mt. Gower (error) = North Ridge.

Although the locality was given by Hedley as "Mt. Gower," the specimens are lowland shells from the North Ridge and elsewhere. These were identified in Hedley's earlier report as *textrix* Pfr., although not recognised as such by Etheridge, and presumably by Brazier at first. As above noted, Etheridge's citation of numbers of small *Helices* from the North Ridge as *H. whiteleggei*, and the lack of *textrix* Pfr., compared with the later recognition of the latter, and the errors surrounding *whiteleggei* suggest a transposition of names, which however is purely historical at present, and does not concern our nominations. Hedley gave an excellent description comparing it with *pinicola* Pfr., from the Isles of Pines, from data provided by E. A. Smith concerning the types. Peile discusses (?) *pinicola* Pfr., and concludes: "I am convinced that the locality 'Isle of Pines' given for *pinicola* in P.Z.S. is an error." He made no detailed examination, and did not mention the Isle of Pines shell, though French students, e.g., Gassies, of the New Caledonian fauna, record it as still living at the Isle of Pines. From comparison the Lord Howe Island shell is distinct, according to Smith, as above noted. Hedley gave anatomical details, and recorded the radula formula as 130 x 13.8.1.8.13, with figures. Hedley observed that the initial whorl and a half showed radial hair lines, decussated by equally fine spiral striae. Examination of many specimens shows variation in this respect, the basis of the scheme being a smooth initial half whorl succeeded by radials. In some a faint microscopic decussation can be discerned, but the radials more often become more pronounced until the protoconch may be said to be entirely radially striate. I mention this as forms had been separated by means of this character.

GOWEROCONCHA WILSONI, sp. nov.

From the tops of the mountains, specimens occur much larger, flatter, with the spire more sunken, and the shell more discoidal. Upon critical examination the protoconch shows heavy radials, separable at sight from any phase of the lowland species. Further, two whorls are thus sculptured, a slight varix marking the boundary from the regular radials of the adult, which are closer than in the preceding, especially marked on the first adult whorl. Hedley recorded, for *waterhousiae*, the radial ribs, as ninety-five on the last whorl, fifty-three on the penultimate and thirty-two on the antepenultimate. Many have been checked and these figures are in agreement with the average Lowland shell. Hedley's size was also 7 mm. by 6 mm. by 3.5 mm., while the shell from the heights goes 10 mm. by 8.75 mm. by 3.5 mm. The riblets on the first whorl of *wilsoni* number sixty, on the second seventy-five, and on the last one hundred and ten to one hundred and twenty. The coloration is bright fawn with wavy red oblique flame markings, while the Lowland shells are dull, as Hedley described, pale buff with madder brown markings.

The type is from the top of Mt. Lidgbird, but similar shells occur on the top of Mt. Gower. This beautiful shell is named in memory of Gower Wilson, under whose leadership I reached the top of Mt. Gower, where I managed to collect some dead shells of this species, visibly separable from the smaller lowland shells.

GOWEROCONCHA WENDA, sp. nov.

(Plate xix., fig. 17.)

Shell smaller than *waterhousiae*, but of that relationship, colour pale brown. Shell small, discoid, last whorl descending a little when adult, protoconch a little sunken, two whorls with fine almost microscopic radial striae ending with a varix, adult sculpture of fine erect radial lirae, forty on the first adult whorl, fifty-five on the next and seventy on the last, the interstices with fine radial threads. Mouth subcircular, lip thin, columella vertical. Umbilicus very wide, exposing all whorls, more than one-third of the diameter of the shell. Breadth, 4.5 mm.; height, 2 mm. Top of Mt. Gower.

Four species described by Pfeiffer have been included in the Lord Howe Island fauna, and since rejected. Peile has re-examined the types and agreeing with the elimination of three suggests the admission of the fourth, without however furnishing any data to support his suggestion. These four were *Helix textrix*, *Helix cimex*, *Helix caecilia* and *H. ignava*. The first was dismissed long ago, the last two Peile does not exactly determine but concludes they are not natives of this island. The fourth, *Helix cimex*, he states, is broken and mended, but has the aspect of some Lord Howe Island species, and therefore may await re-discovery.

HELIX CIMEX, Reeve.

Helix cimex Reeve, Conch. Icon., Vol. vii., pl. 201, fig. 1411, December, 1854. Lord Howe Island, New Hebrides (Cuming). Cites "Pfr., P.L.S., November, 1854," but Pfeiffer's description was read at the December meeting, and published, p. 288, May 8, 1855.

No measurements were given by Reeve, who, however, gives height line which is 4 mm., and the figure shows coarse sculpture. Pfeiffer described his shell as being very finely striated, and measuring 3 mm. in breadth by

1-1/3rd mm. in height. Nothing agreeing with these two diverse descriptions is known here.

It may be noted that *Helix pinicola* is figured in the same place, fig. 1413, and was localised as from "Isle of Pines (Macgillivray)," Pfeiffer's description occurring later alongside that of *H. cimex* (p. 287).

Genus *PULCHAROPA*, *nov.*

Type, *P. plesa* *nov.*

A small Charopid with distant ridges, subglobose shape, vertical columella, umbilicus deep, crateriform, of medium width, the edges showing a crenulate rim, lip thin, no internal teeth in mouth, which is deeper than broad.

PULCHAROPA PLESA, *sp. nov.*

(Plate xix., fig. 22.)

Shell depressedly globose, spire almost flat, whorls convex, sutures deep, umbilicus open, less than a third the breadth of the shell, deep, perspective, sides steep, mouth a little deeper than broad, columella vertical, thin, not reflected, outer lip thin, sculpture of strong distant ribs. Coloration, dull fawn flamed with dull red. Apex one and a half whorls large smoothish microscopically striate radially, succeeding whorls with distant ridges, twenty-five on the first whorl, interstices microscopically striate radially, thirty to thirty-five ridges on next whorl, twenty-four on last three-quarters of a whorl, more widely separated than preceding; a larger shell with half a whorl more has mouth descending a little. Breadth, 3.5 mm.; height, 2.25 m. Boat Harbour and North Bay. A specimen collected by C. Hedley, without detailed location but definitely lowlands, is smaller, with distant ribs more regularly placed and more numerous.

Genus *CHAROPELLA*, *nov.*

Type, *C. zela*, *nov.*

Very small Charopid, somewhat discoidal in form, widely umbilicate, periphery subkeeled, colour flammulate, mouth small, subcircular, unarmed, lip thin, columella vertical, umbilicus wide, open, about one-third the diameter of the shell, apical whorls smooth.

While dealing with these small Charopids a couple of items regarding Norfolk Island forms may be interposed. Preston (Ann. Mag. Nat. Hist., Ser. 8, Vol. xii., p. 534, December, 1913) introduced the genus *Cryptocharopa*, for a small mud-carrying form, which he called *atlantoididea*. Examination of the type of *Helix exagitans* Cox (Proc. Zool. Soc. (Lond.), 1870, p. 82: Norfolk Island), which is broken, shows that it is undoubtedly Preston's species, and Cox's name must be revived for the type of *Cryptocharopa*. In the same place Preston called another shell *Charopa mathewsi*, which is somewhat like the present species, but is flatter, more discoidal, more widely umbilicate, thin, mouth subquadrate, sculpture radials, interstices reticulate, apical whorls smooth, and is here made the type of a new genus, *Penescosta*. It is hoped to review completely the Norfolk Island Land Mollusca at an early date.

CHAROPELLA ZELA, *sp. nov.*

(Plate xix., fig. 20.)

Shell small, subdiscoidal, spire elevated a little, whorls rounded, sutures

deep, last whorl subkeeled peripherally. Coloration, pale fawn flamed with golden brown. Apical whorls one and a half, smooth, adult whorls three and a half, sculptured with separate ribs closely set together, the interstices radially striate, the ribs number about seventy on the last whorl. The mouth subcircular, the outer lip thin, columella small, vertical, a glaze crossing body whorl to edge of outer lip. Breadth, 3 mm.; height, 1.5 mm. Top of Mt. Gower.

CHAROPELLA WILKINSONI, Brazier.

Helix wilkinsoni Etheridge, Austr. Mus. Mem. No. 2, p. 26, May 1, 1889.
Nomen nudum. "A pretty, flatly coiled, and equally rare shell." North Ridge.

Helix (Charopa) wilkinsoni Brazier, *ibid.*, pl. v., figs. 3-4.

Charopa wilkinsoni Hedley, Rec. Austr. Mus., Vol. i., p. 138, June, 1891, described.

The figures, though reversed, showed the upper and lower surfaces of the species Hedley described as measuring $2\frac{1}{2} \times 2 \times 1$ mm., obtusely carinate, yellow and red radiating dashes, microscopic costae decussated by similar spiral lyrae (sic) umbilicus one-third.

Hedley collected some specimens about the same locality, and these prove to be related to *zela*, but are much flatter, more whorls, more strongly keeled, with finer sculpture, and with wide, open umbilicus. They measure fully 3 mm. in breadth, with only 1 mm. in height.

Genus GYROPENA, nov.

Type, *G. verans*, nov.

Small discoidal Charopids, spire sunken, mouth vertical, unarmed, widely umbilicate, columella small, straight, apical whorls large, concentrically striate, sculpture of very fine, close-set ribs, too numerous to count easily, probably about eighty on first adult whorl

GYROPENA VERANS, sp. nov.

(Plate xix., fig. 16.)

Shell discoidal as above. Coloration pale fawn with brown patches which increase to uniformity. Umbilicus open, about one-third the breadth of the shell. Breadth, 3 mm.; height, 1.25 mm. Top of Mt. Gower.

A larger one is broken but the mouth is descending.

Genus CHAROPINESTA, nov.

Type, *C. sema*, nov.

Smallest Charopids, depressed turbinata, spire a little elevated, whorls rounded, sutures deep, mouth subcircular, umbilicus narrow, deep, sculpture fine. A series of very small Charopids with unarmed mouth recall the armed forms from Norfolk Island and the Kermadecs, but there is an unarmed similar one from the latter place.

CHAROPINESTA SEMA, sp. nov.

(Plate xix., fig. 14.)

Very small, depressedly turbinata, as above. Coloration pale yellowish. Sculpture very fine threads radially, no concentric striae observed. Apical whorls smooth. Umbilicus deep, open, about one-fourth the diameter of

the shell, mouth subcircular, a little large for form of shell. Breadth, 1.5 mm.; height, 1 mm. Goat Island; and on the lowlands.

CHAROPINESTA GOWERI, *sp. nov.*

(Plate xix., fig. 15.)

Shell a little larger, similar in form, spire less elevated. Coloration deep red-brown. Sculpture of fine threads radially, but more pronounced and more distinct, and there appears to be a slight concentric striae noticeable on base. Apical whorls smooth. Umbilicus deep, open, about one-fifth the diameter of the shell, mouth subcircular, lip thin. Breadth, 2.25 mm.; height, 1 mm. Mt. Gower.

CHAROPINESTA SUAVIS, *sp. nov.*

(Plate xix., fig. 21.)

Similar to the two preceding. Coloration red-brown. Similar sculpture of fine radial threads, most like *sema*, but of the size of *goweri*, and with smaller umbilicus. Apical whorls faintly radially striate, the spire less elevated than in the preceding, no concentric striae visible. Umbilicus deep, about one-fifth the breadth of the shell. Breadth, 2.5 mm.; height, 1 mm. Mt. Lidgbird, near the top.

Genus *PERNASTELA*, *nov.*

Type, *P. charon*, *nov.*

Shell small, conicoturbinate, whorls rounded, sutures deep, periphery semi-keeled, base rounded, umbilicus open, deep, mouth small, rather quadrate, not continuous, lip thin, apex spirally striate, adult distant ribs radially. This may be classed in the Charopidae tentatively.

PERNASTELA CHARON, *sp. nov.*

(Plate xix., fig. 23.)

Shell as above. Coloration pale fawn with darker markings. Apex large, a little elevated, adult sculpture of rather distant ribs running into umbilicus, which is medium, about one-fifth the diameter of the base. The interstices between the ribs are radially threaded. Mouth rather small, columella vertical, thin. Breadth, 3 mm.; height, 2 mm. Lowlands, near the Pines, etc.

PERNASTELA HOWENSIS, *sp. nov.*

(Plate xix., fig. 18.)

Similar in form but with much finer sculpture. Coloration uniform brown. Apex large, adult sculpture regular, closely set ribs running into umbilicus, which is about one-fourth width of base. Mouth quadrangular, columella straight, lip thin. Breadth, 3.5 mm.; height, 2 mm. Heights of Mt. Gower.

PERNASTELA GNOMA, *sp. nov.*

(Plate xix., fig. 8.)

Very small, with very coarse sculpture. Five whorls, almost shouldered, distant ribs about twenty on last whorl, umbilicus one-fourth of the base, mouth small, sublunar, lip thin. Breadth, 1.5 mm.; height, 1 mm. Black Face, Mt. Lidgbird.

Family MICROCYSTIDAE.

Burrington Baker's iconoclastic treatment of Pacific *Microcystis*, etc., has left a pile of rubble, sparing no material with which to build anew. Consequently the real classification is left to the "guessing" conchologists, who deal with tangible molluscan remains, and do not sport with elusive intestinal troubles. Each anatomist himself blithely contradicts the other's result, while sometimes naively acknowledging his ignorance of his own native molluscs. Of which more later.

Genus MELLOCONCHA, *nov.*

Type, *M. delecta*, *sp. nov.*

Shell small, elevated conic, whorls rounded, base rounded, columella straight, reflected, imperforate, mouth sublunar, lip thin.

This somewhat recalls *Kieconcha*, which, in my youth, I left unfigured (at that time I was by no means an erudite homonymist (whatever that may mean)), and now remedy my error (plate xx., fig. 14) for comparison.

MELLOCONCHA DELECTA, *sp. nov.*

(Plate xx., fig. 8.)

Shell small, conic, elevated, whorls a little rounded, sutures impressed, last whorl a little keeled, base rounded, columella straight, reflected, mouth sublunar. There is no distinct sculpture, nor are the apical whorls distinguished from the adult whorls. There are about six whorls in all, brown in coloration. Breadth, 5 mm.; height, 4 mm. North Bay, also on heights.

MELLOCONCHA PRENSA, *sp. nov.*

(Plate xx., fig. 9.)

Shell small, depressed, spire a little convex, whorls rounded, sutures impressed, last whorl very rounded, base rounded, imperforate, columella straight, reflected, thickened, mouth rather large, lip thin. Coloration pale greenish, glossy. Whorls six, apical ones not distinct, all minutely striate. Breadth, 7 mm.; height, 3.5 mm. North Ridge.

MELLOCONCHA GRATA, *sp. nov.*

(Plate xx., fig. 13.)

Shell small, subconical spire, whorls rounded, suture impressed, last whorl keeled, columella a little slanting, reflected, mouth sublunar, large, lip thin. Coloration deep bright brown. Whorls five, microscopically striate, no difference between adult and apical whorls. Breadth, 7 mm.; height, 5 mm. Mt. Gower, near the top, on moss.

Genus TRIBOCYSTIS, *nov.*

Type, *T. rosacea*, *nov.*

Small Microcystid shells, subdiscoidal, flattened spire, subkeeled periphery, imperforate, columella slanting, thickened, mouth small. If we judge by Burrington Baker's standards each of the shells here mentioned may be the basis of a subgenus.

TRIBOCYSTIS ROSACEA, *sp. nov.*

(Plate xx., fig. 7.)

Shell small, subdiscoidal, spire very little raised, whorls slightly convex,

sutures impressed, last whorl keeled at periphery, base rounded, columella slanting, slightly thickened. Whorls four and a half, no difference between the apical and adult whorls, sculpture microscopic radial growth lines. Coloration fawn with a rosy tint, darker towards the apex. Breadth, 4 mm.; height, 1.5 mm. Lowlands, near the Pines, etc.

TRIBOCYSTIS FLAVESCENS, sp. nov.

(Plate xx., fig. 10.)

Shell small, larger than preceding but similar in form, spire more elevated. Coloration pale yellowish. Whorls five and a half with no distinction between the apical and adult ones, smooth, only faint growth lines, columella almost vertical, a little thickened. Breadth, 6 mm.; height, 3.25 mm. Lowlands, North Ridge, etc.

TRIBOCYSTIS ALMA, sp. nov.

Shell very small, subdiscoidal, spire little elevated, whorls rounded, sutures impressed, last whorl very rounded, base rounded, mouth oval, columella slanting, thickened. Coloration yellowish fawn, glossy. Shell smooth, sculpture only indistinct growth lines, a little more evident on the earlier whorls, no concentric sculpture. Mouth transverse, semilunar, outer lip thin, a fine glaze connecting the inner and outer lip across the glaze. Breadth, 4 mm.; height, 2 mm. North Ridge.

ANNACHARIS MIRANDA, gen. et. sp. nov.

(Plate xx., fig. 2.)

Small Microcystid with channelled sutures and thickened columella. Shell globosely turbinate, thin, glossy greenish, spire elevated, whorls convex, deeply channelled at sutures. Whorls six and a half. Sculpture only growth striae. Mouth semilunate, medium size, columella slanting, heavily callused. Breadth, 7 mm.; height, 4.5 mm. Found by Dr. W. R. B. Oliver on the top of Mt. Gower. Also on the top of Mt. Lidgbird by Roy Bell.

All the preceding agree in being imperforate, and may be more or less generally related to each other, but the next two stand quite apart, and it would be interesting to compare anatomical reports from two sources.

Genus *DIGNAMOCONCHA, nov.*

Type, *D. dulcissima, nov.*

Shell small, delicate, thin, flat-topped, periphery sharply keeled, sloping inwards, a little convexly, to deep wide crateriform umbilicus, mouth quadrate, lip thin. Sculpture, delicate decussation.

DIGNAMOCONCHA DULCISSIMA, sp. nov.

(Plate xx., fig. 6.)

Shell small, whorls very slightly convex, spire little elevated, periphery with fine pinched keel, below sloping inwards until stopped by another sharp keel bordering a broad craterlike umbilicus, deep, perspective, disclosing all whorls to apex, columella slanting upwards, a little reflected, mouth quadrangular, lip thin. Coloration greyish-fawn flamed with brownish. Apical whorls two, adult whorls three. Sculpture of minute radial threads crossed by minute concentric striae, the under-surface showing the threads more prominently. Breadth, 6 mm.; height, 3 mm.

From top of Mt. Lidgbird. An odd specimen from top of Mt. Gower. There is a tendency for the last whorl to descend with age.

Genus *DELICIOLOA*, *nov.*

Type, *D. charis*, *nov.*

Shell minute, subdiscoidal, flat-topped, apex a little elevated, periphery strongly keeled, base very convex, umbilicus small, deep, mouth a little broader than high, columella straight, lip thin.

DELICIOLOA CHARIS, *sp. nov.*

(Plate xx., fig. 12.)

General features of shell as above. Colour greenish-fawn. Adult whorls two and a quarter, one and a half apical whorls smooth. Sculpture of upper surface radial threads closely set, a little raised, forming a peripheral fringe, a slight depression preceding the keel, sutures deep; sculpture of base microscopical radials. Breadth, 2 mm.; height, 1 mm.

Family ZONITIDAE.

Etheridge wrote, p. 26: "On the low grounds at the northern end of the island, amongst cultivated ground, a small species was found in numbers to which the name of *H. Unwini* Brazier, is attached." This is a *nomen nudum*. On plate iv., figs. 5-6, *Helix* (*Patula*) *Unwini* Brazier, is figured (reversed). Hedley described the species under the genus *Patula*. Now Peile, from examination of a series sent by Brazier, states that this is the American shell, *Zonitoides minusculus* Binney. Now we really find trouble as this species had been made the type of a genus, *Pseudovitrea*, by Baker, the type of *Zonitoides* being the shell known as *nitida* Muller. By the way, I noticed that Taylor stated the Australian shell known as *nitida* Muller, is not that species, but *alliaria* Miller. Then Baker further states that the Hawaiian shell, *kawaiensis* Pfr., i.e., Reeve, made the basis of a new genus, *Hawaiiia*, by Gude, is identical with the American *minusculus*, though he it noted it is half as big again as the latter, different colour, form, etc. Consequently, if Baker be followed, *Helix unwini* Brazier, should be regarded as a synonym of *Hawaiiia minusculus* Binney. It may be remarked that Baker places *Hawaiiia* in a separate subfamily from *Zonitoides*. In the same place Baker apologises for the ignorance of palaeoartctic forms, while sweeping through the Pacific fauna like a bush-fire.

Roy Bell found the species in the Old Settlement living alongside *Vallonia*, sp. I should determine this as *pulchella* Müller, but it seems difficult for British conchologists to separate this species from *excentrica* Sterki, as some regarded Norfolk Island shells as the latter. Perhaps both "species" occur in the Australasian localities as Sterki always found them together in Europe and America.]

Family NITORIDAE.

To this family is allotted the species named *catletti* and its allies. The species are larger than the Microcystids, and have a different appearance, though their general characters are very similar, but the animals have been stated to differ by anatomists, who, however, as usual, disagree.

Genus *INNESOCONCHA*, *nov.*

Type, *H. catletti*, Brazier.

Shell small, but always larger than species of *Microcystis* (s.l.), sub-

discoidal to subconical, whorls rounded, periphery keeled, base rounded, imperforate, mouth transversely semilunar, edge of lip thin, columella slanting, thickened. Animal viviparous, young being found in the adult shells.

INNESOCONCHA CATLETTI, Brazier.

Helix (Microcystis) catletti Brazier, Proc. Zool. Soc. (Lond.), 1872, p. 617, November 3. Lord Howe Island, off the coast N.S.W. (Coll. Austr. Mus.).

Microcystis catletti Hedley, Rec. Austr. Mus., Vol. i., p. 137, pl. xxi., fig. 5, June 30, 1891. (Rabbit Island.).

The measurements are 4 by $3\frac{1}{2}$ by $2\frac{1}{4}$ lines, i.e., 8 by 7 by 4.5 mm., a somewhat conical shell. This was recognised as from Goat Island, as Etheridge wrote: "The little Rabbit or Goat Island does not appear to have a species peculiar to itself, for *H. catletti* Brazier, the common species here, occurs on the main island." However, when the mainland shells were compared, they were found to be larger and comparatively less elevated, and were named

MICROCYSTIS CATLETTI var. MAJOR, Hedley,

in the Rec. Austr. Mus., Vol. i., p. 137, June, 1891, from the Old Settlement.

This has been re-named *subconica*, measuring 11 mm. by 10 mm. by 6 mm., on account of the invalid varietal name. Hedley used the genus *Microcystina*, in the explanation to plate.

INNESOCONCHA SEGNA, *sp. nov.*

Specimens from Boat Harbour, an inlet on the south-east coast, differ in their large size, flattened form and glossy surface. Coloration pale green. Subdiscoidal, spire a little elevated, periphery very slightly keeled, base rounded, mouth rather large, transverse, columella slanting, thickened and toothed, and leaving no signs of chink seen in preceding. Breadth, 11.5 mm.; 6.5 mm.

INNESOCONCHA PRINCEPS, *sp. nov.*

(Plate xx., fig. 5.)

Another large species from the heights of Mt. Gower differs at sight in its bright coloration, being banded with brown and white. Shell subdiscoidal, spire a little elevated, very slight peripheral keel, mouth smaller than in preceding, columella less slanting, scarcely thickened. Whorls six, no demarcation between apical and adult, sutures lightly impressed. Shell smooth, only indistinct growth lines present. Breadth, 10 mm.; height, 5.5 mm. Heights of Mt. Gower.

INNESOCONCHA ABERRANS, *sp. nov.*

(Plate xx., fig. 15.)

Shell strongly elevated, conical, whorls little convex, sutures light, last whorl keeled at periphery, base rounded. Coloration brown. Whorls six, no apical distinction, sculpture microscopic radial growth lines forming matt surface, mouth large, columella almost straight, thin. Breadth. 7 mm.; height, 6 mm. Black Face, Mt. Lidgbird.

Family GUDEOCONCHIDAE.

The beautiful large shell called *Helix sophiae* by Gaskoin, the name however first published by Reeve, seems to be referable exactly to no

expressed family, although its anatomy is known. As a matter of fact that seems to complicate matters, so that it seems best to allow it a family for itself until the anatomists decide.

Genus *GUDEOCONCHA*, nov.

Type, *Helix sophiae*, Reeve.

Shell large, thin, whorls few, spire a little elevated, last whorl disproportionally large, mouth large, broader than long, lip thin, columella slanting, a little reflected, umbilicus present but very small.

The animal was figured by Cox (Proc. Linn. Soc. N.S.W., Ser. 2, Vol. ii., p. 1061, pl. xx., figs. 8-9, 1888), as a species of *Helicarion* on account of its external form. Hedley, after dissecting the species in connection with other snails, concluded "*Sophiae*, *howinsulae* and *hilli* are allied species, and are rather too dissimilar to the type of *Helicarion* to be admitted into that genus. I prefer to leave them at present under *Nanina*, using the name in its widest significance." The radula formula was given for the var. *conica* as 140 rows of 70:26:1:26:70.

GUDEOCONCHA SOPHIAE, Reeve.

Helix sophiae Reeve, Conch. Icon., Vol. vii., pl. 196, fig. 1377, December, 1854. Lord Howe Island. Macgillivray.

Helix sophiae Gaskoin, Proc. Zool. Soc. (Lond.), 1854, p. 152, April 11, 1855. Lord Howe Island. (1-8/10th in. by 6/10th inch.).

Helicarion sophiae Cox, Proc. Linn. Soc. N.S.W., Ser. 2, Vol. ii., p. 1061, pl. xx., figs. 8-9, 1888.

Nanina sophiae Hedley, Rec. Austr. Mus., Vol. i., p. 135, June 30, 1891.

The type, figured by Reeve, was a large Lowland shell, with spire a little elevated and the figure's measurements equal, 30 mm. by 20 mm. It was very common and variable, but the variation was not collated with locality, save in the case of the Rabbit or Goat Island form, which Brazier called *NANINA SOPHIAE* var. *CONICA*, figured in the Museum Report, pl. v., figs. 5, 6, while Hedley in the Records of the Aust. Mus., Vol. i., p. 135, pl. xxi., fig. 3 (jaw), and pl. xxii., fig. 7 (radula), June 30, 1891, figured the jaw and radula, giving the formula as above.

Anywhere else these would be easily regarded as distinct, the measurements, 30 by 20 mm., and 25 by 19 mm., giving little real idea of the distinctive appearance. Roy Bell sent many specimens from the heights of the mountains of a larger size and more depressed appearance, but the most marked form was one from the little Slope of Mt. Gower which was named

GUDEOCONCHA MAGNIFICA.

This is much larger, mouth more expanded, spire more depressed, shell thinner and sculptured with very fine ripple marks, and of bronze coloration, the shell showing little calcification, the type measuring 39 mm. by 19 mm., with the aperture 23 mm. by 14 mm.

The juvenile of all the forms is seen as a flat-topped shell, the apical whorls slightly elevated, a strong peripheral keel with the base very convex, a small umbilicus, the columella only slightly reflected: first one and a half whorls smoothish ending with a slight varix, the succeeding adult sculpture of obsolete radials, a pronounced small tucker along the edge of the peri-

phery; the under-surface finely radially striate crossed by fine concentric striae. With age the whorls descend, the mouth broadens, peripheral keel disappears and umbilicus almost vanishes.

Family EPIGLYPTIDAE.

Although Hedley denied the association of this species with *Helicarion*, Baker interprets his denial thus: "As indicated by Hedley, *Epiglypta*, although a distinct genus, must be quite closely related to *Helicarion*." Such an interpretation is inadmissible as the *Helicarions*, as loosely understood at present, constitute a confused series of similar shell construction, which is quite unlike *Epiglypta* in every detail. The introduction of the name *Epiglypta* is worthy of quotation in view of the many recriminations in recent years. Pilsbry, in the *Man. Conch.* (Tryon), Ser. 2, Vol. viii., p. 133, February 25, 1893, included "Vol. iii., p. 90. *H. howinsulae* is a species of *Nanina*, and the type of the section *Epiglypta* Pils." Referring back to Vol. iii., p. 90, among the unfigured species is the name "*H. howinsulae* Cox. Lord Howe Island."

As a matter of fact, this is a very beautiful shell of outstanding distinction with no relationship to any *Helicarionid*. Shell large, thin, depressed Helicoid, upper surface convex, lower surface more convex, a notable fringed peripheral keel separating the upper highly sculptured surface from the lower smooth surface, mouth large, open, very little broader than deep, columella sloping, a little reflected, almost concealing the umbilical chink.

Hedley gave the radula formula as 120 rows of 90.24.1.24.90, and Baker counted 103.25.1.25.103.

EPIGLYPTA HOWINSULAE, COX.

Helix howinsulae Cox, Proc. Zool. Soc. (Lond.), 1873, p. 148, June. On a mountain, Lord Howe Island.

Helix howinsulae Cox, Proc. Linn. Soc. N.S.W., Ser. 2, Vol. iv., p. 660, pl. xix., figs. 10-11, 1890. (Upper and lower surfaces.)

Nanina howinsulae Hedley, Rec. Austr. Mus., Vol. ii., p. 135, pl. 21, fig. 7; pl. 22, figs. 5-8, June 30, 1891. (Anatomy.)

Epiglypta howinsulae Baker, Bernice P. Bishop Mus., Bull. 166, p. 264, pl. 47, figs. 1-3, 1941. (Anatomy.)

The shell is a bright red brown in colour, the upper surface sculptured with numerous wavy ribs, which strongly crenulate the keeled periphery. It has been long known as living on the heights of Mt. Gower, and when Roy Bell scaled the hitherto inaccessible peak of Mt. Lidgbird, and found the species living there, specimens were critically examined, but not the slightest variation could be determined.

The immature proves to be planulate above, convex below, narrowly openly umbilicate, columella slightly reflected exactly as in adult; first whorl smoothish convex, sometimes faintly radiate, developing an antepерipheral groove and stronger radials, which developed into the adult sculpture and ornament the periphery, under surface showing radials faintly. With age the whorls descend a little to provide the convex upper surface, the mouth descending, the columella thickening and entirely covering the umbilicus. Breadth, 38 mm.; height, 20 mm.

Family HELICARIONIDAE.

This is by no means the "family" so-called by Baker, which is a pot

pourri, composed of imaginary genital complexes (or perplexes), which have been dissected out of discordant molluscan shell remains.

The present family is restricted to shells generally agreeing with that of *Helicarion*, s. str., but even with this limitation it cannot be considered a homogeneous association. However, we have one factor in our favour, *Helicarion* was based on an Australian development, and these may be related.

Genus *HOWEARION*, nov.

Type, *Howearion belli*, nov.

A flat-topped semi-globose *Helicarion* with a radula formula of 163 rows of 430.24.1.24.430. The immense number of marginals easily distinguish this form, as other *Helicarion*-like genera have very different formulae, e.g., *Vercularion*, 103.17.1.17.103, *Mistarion*, 45.18.1.18.45, and *Ellarion*, 20.12.1.12.20.

Dendrolamellaria Preston, Ann. Mag. Nat. Hist., Ser. 8, Vol. xii., p. 522, December 1, 1913, with type, *D. mathewsi* Preston, from Norfolk Island, has a very different shell, while the Kermadec *H. kermadecensis* Smith, is smaller, very thin, more convex spire, more globose, base even thinner, and may be distinguished as *Kermarion*, gen. nov.

HOWEARION BELLI, sp. nov.

(Plate xx, fig. 3.)

Shell thin, subglobose, spire a little elevated, mouth large, a little rounded, columella curved, not reflected. Coloration shining green. Surface smooth. Breadth, 15 mm.; height, 10 mm. Top of Mt. Gower.

HOWEARION HILLI, COX.

Helicarion hilli Cox, Proc. Zool. Soc. (Lond.), 1873, p. 151, pl. 16, figs. 7a-b, June. "On the top of a high mountain, Lord Howe Island."

Cox wrote: "Striped with lines of growth transversely, and longitudinally at irregular intervals with fine waved lines." Size, .34 in. by .25 in. by .14 in. This is a small shell, equalling 8.5 x 6.25 x 3.5 mm., but the illustration, supposed to be natural size, is double that, and there appears to be confusion once again with the locality, as Etheridge wrote, p. 26: "On the lower grounds . . . we also found *Helicarion Hilli*, Cox, but did not trace it above a height of 400 to 500 feet."

The lowland shell, dissected by Hedley, and recorded as *Nanina hilli*, Rec. Austr. Mus., Vol. i., p. 136, pl. xxii., fig. 6 (jaw), pl. xxii., fig. 2 (radula), June 30, 1891, differs from the highland form in its lower spire and broader mouth, as figured by Cox, and especially by the well-marked, though microscopic, concentric wavy striae.

A normal specimen measures 18 mm. in breadth by 8 mm. in height, and is very pale greenish, and was called *palmarum*, the exact identity of *hilli* being doubtful.

Genus *PARMELLOPS*, nov.

Type, *Parmella etheridgei*, Hedley.

Hedley fully described a curious mollusc, under the above name, as cited below, and referred it to *Parmella*, introduced by H. Adams, Proc. Zool. Soc. (Lond.), 1867, p. 308, pl. xix., fig. 20, October 22, from Fiji. Baker, how-

ever, regards the Fijian shell as "Genus and species remain *nomina dubia*. However, a *Helicarion*-like derivative of *Orpiella* would not be surprising."

Shell almost planate, few whorls, last very large, outer edge a little curved, base missing, sculpture of growth lines only, a thin golden periostracum present in life. Radula formula of 145 rows of 300.15.1.15.300.

Hedley referred the species "to a distinct and well-defined genus of the *Helicarioninae*," and the genus is included in the family *Helicarionidae*, as here restricted.

PARMELLOPS AUSTRALIS, Reeve.

Vitrina australis Reeve, Conch. Icon., Vol. xiii., pl. x., sp. 70, May, 1862. Eastern Australia.

Vitrina etheridgei Etheridge, Austr. Mus. Mem. No. 2, p. 26, May 1, 1889. *Nomen nudum*. Lower grounds, Lord Howe Island.

Vitrina (*Parmella*) *Etheridgei* Brazier, *ibid.*, pl. v., fig. 9.

Parmella etheridgei Hedley, Rec. Austr. Mus., Vol. i., p. 73, pl. xi., September, 1890. (Anatomy).

Etheridge wrote: "A fine new species of *Vitrina* was found on the stems and leaf sheaths of the palms growing on the lower grounds, and is called by Mr. Brazier, *Vitrina Etheridgei*." This is a *nomen nudum*. Brazier's figure shows the interior, and Hedley gave a sketch of the external appearance while fully discussing the anatomy, and referring it to *Parmella*, another account scorned by Baker.

CONCLUSIONS.

The main conclusion is that there is much to be yet discovered about this faunula, and, while the *Placostylus* indicates New Caledonia as its source, Lord Howe Island must be the remnant of a much larger piece of land, and that the separation must be of very ancient date. To discuss the pros and cons of this molluscan fauna alone would occupy many pages. Thus, the evolution of *Epiglypta* and *Gudeoconcha* must have taken much time, and while it seems the former has reached stabilisation, the latter is still showing local variation. So far no suggestion as to their relationship has been made, worthy of consideration, Baker's allusion to *Epiglypta* being somewhat grotesque. Again the family *Pseudocharopidae* is anomalous, the half dozen species being well differentiated, indicating a long time necessity. As to the many smaller land shells there can be little comparison until the islands to the north are better searched. The only fact is that they have very little in common with the small forms collected at Norfolk Island and at the Kermadec Islands, nor are they at all like the small species known from the east coast of Australia. Many small shells have been collected in New Caledonia, but there is much yet to be done there, and it is possible still that relatives may occur in that place. An interesting ground for study is the coral sand rock which has already revealed many species as noted in an appendix attached hereto.

APPENDIX I.

Subfossil MOLLUSCA.

Etheridge discussed in detail the Coral-sand Rock Series, which is "the chief fossiliferous deposit on the island. It has yielded the remains of *Meiolania*, eggs of turtles, bird-bones, and recent species of both land and

marine shells. . . . The balance of evidence may, I think, be said to weigh in favour of the aeolian origin of the Lord Howe coral-sand rock. . . . The abundance of bird-bones and land shells, with the more or less perfect preservation of the latter. . . . The samples examined allowed the discrimination of many land shells."

Etheridge reported upon the fossil form of the *Placostylus*, but nothing appears to have been recorded about the "many land shells" discriminated. Roy Bell found one place "near Johnson's" or "below Johnson's and T. B. Wilson's," and carefully collected many of the smaller shells with rather surprising results that deserve record for future investigation. More recently, Captain McComish found similar shells at the foot of a cliff in Middle Beach, 70 feet high.

All the shells are more solid than recent specimens, and this seems to be a constant feature of subfossil remains, some calcification taking place after the death of the snails, not before. As instance, in these lots there are many strongly calcified *Parmellops* and *Howearion*, which in life show very little calcification. The occurrence of so many of these frail molluscan shells is remarkable, while they definitely indicate the aeolian nature of the rock. Their plenitude is also strongly confirmatory of that view. The next remarkable feature is the presence of species at present rarely found, and suggest widely spread distribution, and also, perhaps, our incomplete knowledge of this small island molluscan fauna. Thus, *Dignamoconcha dulcissima* was only found on the top of Mt. Gower, and rarely the top of Mt. Lidgbird, yet it is not uncommon in both Roy Bell's collection, and in Captain McComish's series. Another *Pulcharopa plesa* is known from only a few recent specimens from North Bay, North Ridge and Boat Harbour, but is quite common, probably the commonest, shell in Roy Bell's selection.

The full list picked out reads *Palaina m. semilevis*, *P. levicostulata*, *P. howeinsulae*, *P. nicholsae*, *Placostylus bivaricosus* var. *solida*, *Goweroconcha waterhousiae*, *Pulcharopa plesa*, *Pernastela charon*, *Melloconcha delecta*, *Tribocystis rosacea*, *Innesoconcha "major"*, *Dignamoconcha dulcissima*, *Gudeoconcha sophiae*, *Howearion hilli*, and *Parmellops australis*.

One or two others not determinable occur, but a disturbing find was of two of the problematical *unwini*. More research is necessary to prove if these were in situ or were derivative. If the former, a revision of *Hawaiiia* may become necessary.

Another curious factor to be considered is the occurrence of numerous small fresh water shells all over the island, which show variation in every locality. These are mentioned in a succeeding Appendix.

APPENDIX II.

The fact that there are fresh water shells at all on the island is really surprising, so that they may be here mentioned, as their occurrence is noteworthy in many ways. The same confusion arose with these as with the land shells. Etheridge reported (p. 27): "Under very trying circumstances we were fortunate enough to discover fresh water non-pulmoniferous forms at a considerable height on the eastern flanks of Mt. Lidgbird in steep gullies running down to the shore. These consisted of two species of *Bythinella*, crawling over stones. One, a spirally striated shell, with a deep suture, will be described as *B. Whiteleggei*, by Mr. Brazier, and the other as *B. Ramsaii*." There is nothing much determinable here, and the illustrations (reversed) are not much more helpful, as *Bythinella ramsaii* Brazier, pl.

iv., figs. 15, 16, enlarged, "x 3," measures $13 \times 8 = 4\text{-}1/3\text{rd} \times 2\text{-}2/3\text{rd}$ mm., and *Bythynella whiteleggei* Brazier, pl. iv., figs. 17, 18, "x 4," measures $12 \times 7 = 3 \times 1\frac{3}{4}$ mm., the latter being apparently smaller and with deeper sutures.

Hedley fully described, but again altered the habitats, *whiteleggei* "from the creeks to the north of the Old Settlement," size $2\frac{1}{2} \times 1$ mm., and *ramsayi* "Eastern flanks of Mt. Lidgbird," size 4×2 mm., the former "strongly sculptured," the latter with faint striae.

There are obviously two series, a narrow elongate form and a broader bulkier one, apparently represented by *whiteleggei* and *ramsayi* respectively. These are found in most streams, and have evolved colonies in most of them so constant that no fewer than six names were introduced, together with a special generic name. To stabilise the matter so that it will assist later investigations these names are published.

Fluviorissoina, gen. nov. Shell small, few whorls, mouth oval, almost free, breadth more than half length, sculpture of concentric striae.

The type may be selected as *B. ramsaii*. *B. whiteleggei* is more cylindrical, smaller mouth, mouth similar but less produced, more whorls, and breadth not much more than half height. The sutures generally not very deep. The generic name *Pupidrobia* is introduced for this group; type, *P. gracilis*, nov., to mark the distinction for comparison.

When these two occur together, as on the Little Slope, they are easily separable in size, as well as in form, so that we have

Fluviorissoina oscitans, nov. Small and broad; length, 3 mm.; breadth, 2 mm.

Pupidrobia gracilis, nov. Larger and narrower; length, 3.5 mm., breadth, 1.5 mm.

The largest, however, is a *Fluviorissoina*, from Bird Point, which measures in length 4.5 mm., breadth 2.25 mm., which is almost the type form of *ramsayi*. It may be noted that specimens from the Erskine Valley were regarded as typical at that time. Hedley transferred the locality of *whiteleggei* to the creeks of the Old Settlement, with size 2.5 mm. by 1 mm., but much larger shells from thereabouts measuring 3.5 mm. by 2 mm. were named *Pupidrobia pupa*, nov.

The species of *Fluviorissoina* from the same locality measured 3 mm. by 1.75 mm., and were called *royana*, nov. A small species was found on the top of Mt. Gower, measuring 2.5 mm. by 1.5 mm., and was named *pusillior*, nov.

This leaves the Erskine Valley shells, which may provide still more variations, and if a mathematical census were undertaken the results would be astonishing. So far all the samples studied show comparative constancy, a series of some hundred examples from the Erskine Valley being all *Fluviorissoina*, broad like *oscitans*, but a little shorter, and have been called *obesa*, nov., the shell measuring 2.75 mm. in length by 2 mm. in breadth.

The nearest relative appears to be *Hydrobia gentilsiana* Crosse, Journ. de Conch., Vol. xxii., p. 112, January 1, 1874, figured, p. 395, pl. xii., fig. 9, October 1, 1874, measuring 3 mm. by 1.5 mm., from Oubatche, New Caledonia. The genus *Hemistomia* Crosse, *ibid.*, Vol. xx., pl. 72, p. 352, pl. xvi., fig. 8, January-October, 1872, with species, *caledonica*, measuring 2.5 mm.

by .75 mm., seems the most nearly allied genus, and it may be that *Heterocyclus* Crosse, *ibid.*, Vol. xx., p. 156, pl. xvi., fig. 6, 1872, may also be related.

APPENDIX III.

Among a series of Tornatellinids taken from a cut on a tree "Near the Pines" was one specimen of an *Imputegla*, and I was inclined to neglect it, but specimens have now been discovered in the wilds of North-western Australia by Dr. Consett Davis. This suggests that the Lord Howe specimen represents an endemic species so it is here described.

IMPUTEGLA EVADA, *sp. nov.*

Shell small, subglobose, subperforate, thin, translucent, brown. Whorls three, well rounded, suture distinct. Sculpture of very fine striae, no lamellae present. Outer lip thin, columella straight, reflexed, concealing umbilical chink. Shell covered with earthy particles as usual. Breadth, 1.5 mm.; height, 1 mm.

The genus *Imputegla* Iredale (Austr. Zool., Vol. viii., p. 305, March 12, 1937), for *P. circumlitum* Hedley, belongs to the family Pupisomidae.

EXPLANATION OF PLATE XVII.

- Fig. 1. Mount Lidgbird and Mount Gower from Old Settlement beach, looking southward, Goat Island (or Rabbit Island) on right.
- Fig. 2. North Ridge and Mount Eliza from the Lower Road, Wall of Mount Lidgbird at right, looking over lagoon.
- Fig. 3. Southern Razor Back of Mount Gower.
- Fig. 4. Vegetation, S.W. Recess of Mount Gower.

EXPLANATION OF PLATE XVIII.

- Fig. 1. *Monterissa gowerensis*, Iredale.
- " 2. *Opinorelia howeinsulae*, Iredale.
- " 3. *Limborelia innesi*, Iredale.
- " 4. *Tornelasmias lidgbirdense*, Iredale.
- " 5. *Elasmias schola*, Iredale.
- " 6. *Tornelasmias capricorni*, Iredale.
- " 6a. *Tornelasmias capricorni*, Iredale. Mouth of immature.
- " 7. *Tornelasmias inconspicuum*, Brazier.
- " 8. *Palaina capillacea*, Pfeiffer.
- " 9. *Palaina nicholsae*, Iredale.
- " 10. *Palaina howeinsulae*, Iredale.
- " 11. *Palaina waterhousei*, Iredale.
- " 12. *Palaina macgillivrayi semilevis*, Iredale.
- " 13. *Palaina levicostulata*, Iredale.
- " 14. *Palaina edwardi*, Iredale.
- " 15. *Palaina deliciosa*, Iredale.
- " 16. *Palaina macgillivrayi*, Pfeiffer.
- " 17. *Palaina macgillivrayi pusillior*, Iredale.

EXPLANATION OF PLATE XIX.

- Fig. 1. *Palaina padda*, Iredale.
- " 2. *Palaina lucia*, Iredale.
- " 3. *Palaina capillacea definita*, Iredale.
- " 4. *Palaina embra*, Iredale.

- „ 5. *Allenella belli*, Iredale.
- „ 6. *Allenella belli extra*, Iredale.
- „ 7. *Paralaoma royi*, Iredale.
- „ 8. *Pernastela gnoma*, Iredale.
- „ 9. *Allenella formalis*, Iredale.
- „ 10. *Paralaoma abjecta*, Iredale.
- „ 11. *Paralaoma innesi*, Iredale.
- „ 12. *Paralaoma lidgbirdensis*, Iredale.
- „ 13. *Paralaoma compar*, Iredale.
- „ 14. *Charopinesta sema*, Iredale.
- „ 15. *Charopinesta goweri*, Iredale.
- „ 16. *Gyropena verans*, Iredale.
- „ 17. *Goweroconcha wenda*, Iredale.
- „ 18. *Pernastela howensis*, Iredale.
- „ 19. *Hedleyoconcha addita*, Iredale.
- „ 20. *Charopella zela*, Iredale.
- „ 21. *Charopinesta suavis*, Iredale.
- „ 22. *Pulcharopa plesa*, Iredale.
- „ 23. *Pernastela charon*, Iredale.

EXPLANATION OF PLATE XX.

- Fig. 1. *Pseudocharopa (whiteleggei) editor*, Iredale.
- „ 2. *Annacharis miranda*, Iredale.
 - „ 3. *Howearion belli*, Iredale.
 - „ 4. *Pseudocharopa imperator*, Iredale.
 - „ 5. *Innesoconcha princeps*, Iredale.
 - „ 6. *Dignamoconcha dulcissima*, Iredale.
 - „ 7. *Tribocystis rosacea*, Iredale.
 - „ 8. *Melloconcha delecta*, Iredale.
 - „ 9. *Melloconcha prensa*, Iredale.
 - „ 10. *Tribocystis flavescens*, Iredale.
 - „ 11. *Pseudocharopa gowerensis*, Iredale.
 - „ 12. *Deliciola charis*, Iredale.
 - „ 13. *Melloconcha grata*, Iredale.
 - „ 14. *Kieconcha kermadeci*, Pfeiffer.
 - „ 15. *Innesoconcha aberrans*, Iredale.
-



Photographing nest of Black-chinned Honeyeater. Nest indicated by arrow.



Black-chinned Honeyeater at nest.



(b) Tawny-crowned Honeyeater and young in nest.



(a) Brush Wattle-bird at nest.
—Photograph by Norman Chaffer.



(b) Yellow-tufted Honeyeater on nest.
—Photograph by Roy P. Cooper.



(a) Painted Honeyeater with Mistletoe berry.



(a) Fuscous Honeyeater at nest.



(b) Regent Honeyeater feeding young.
—Photograph by Norman Chaffer.



(c) Nest of Regent Honeyeater.
—Photograph by Norman Chaffer.



(d) Yellow-faced Honeyeater restrained from
entering nest.



White-eared Honeyeater seeking nesting material.



White-eared Honeyeater.



White-cheeked Honeyeater at nest.



White-bearded Honeyeater at nest.



Young Soldier Birds.



A Killer Whale.



"Jackson."



"Typee."



"Tom," whose skeleton is in the
Eden Museum.



"Hooky."



"Humpy" chasing the Whale.

The Killer Whales of Eden, N.S.W.

—Photographs by C. E. Wellings, Eden.



Indian Killer Whale Designs.



Mounts Lidgbird and Gower.
Lord Howe Island.



View of the Lagoon and Rabbit
Island from the Lower Road.

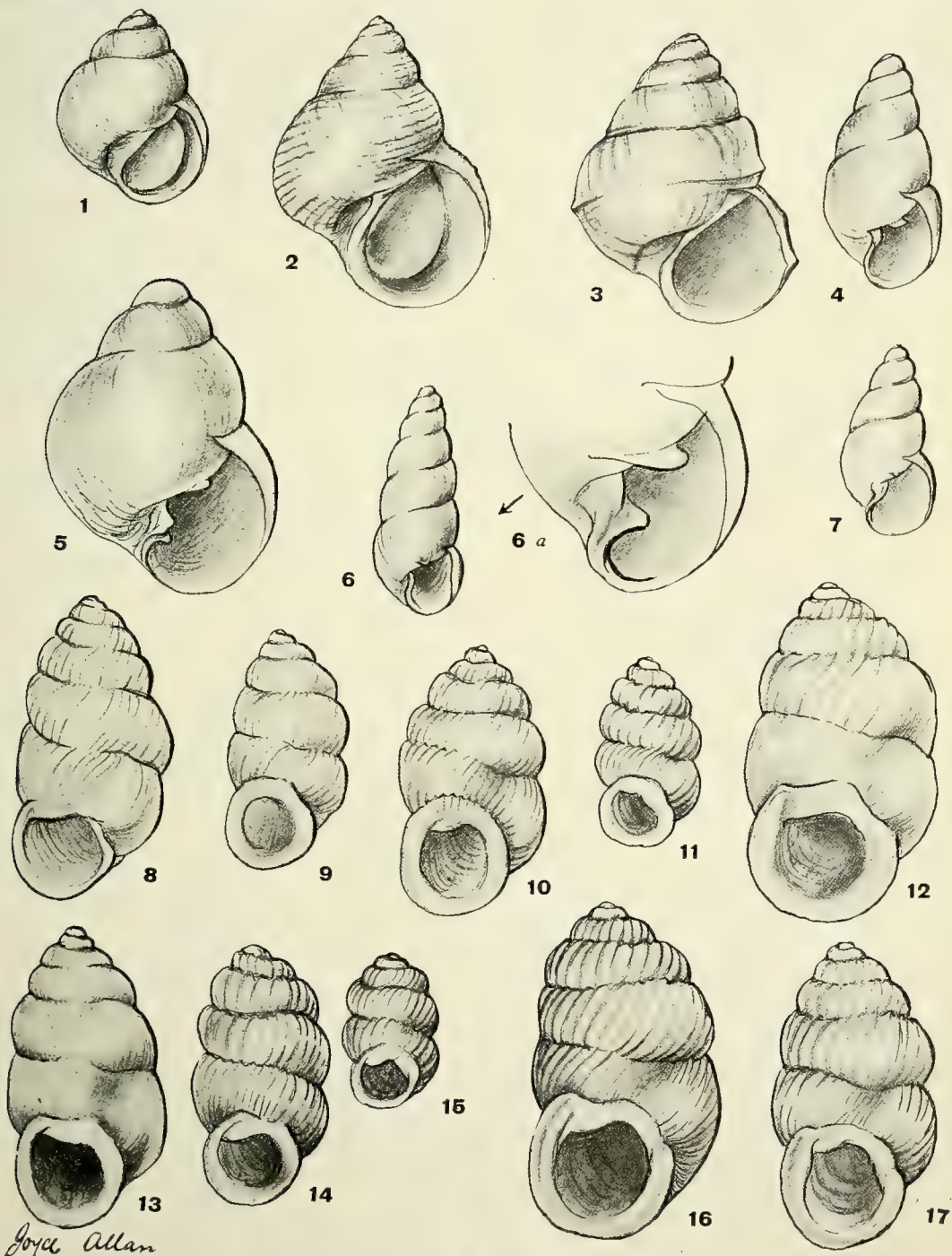


South-eastern Spur of Mt. Gower.



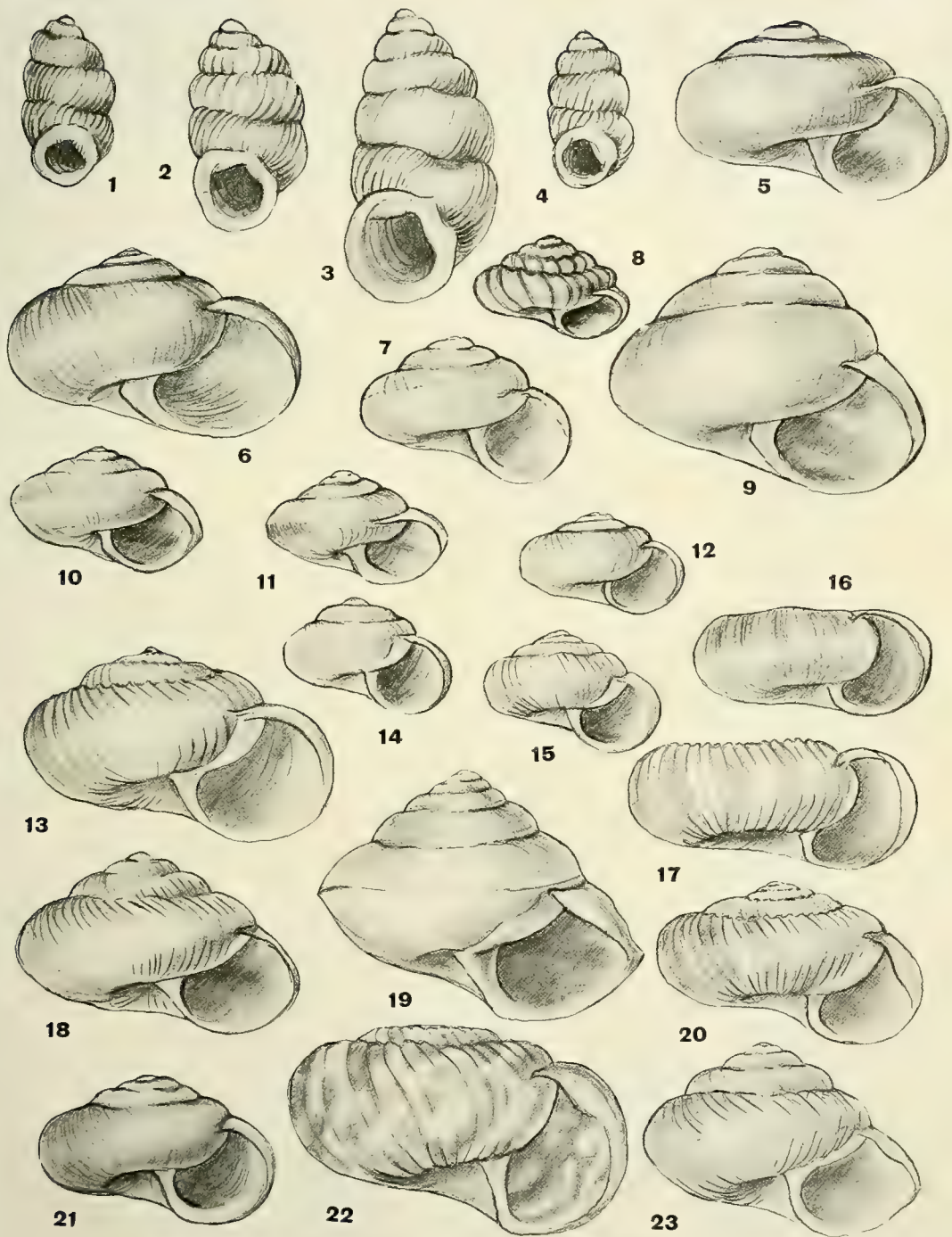
Characteristic Vegetation of Lord Howe Island.

Photographs by Roy Bell
and A. R. McCulloch.



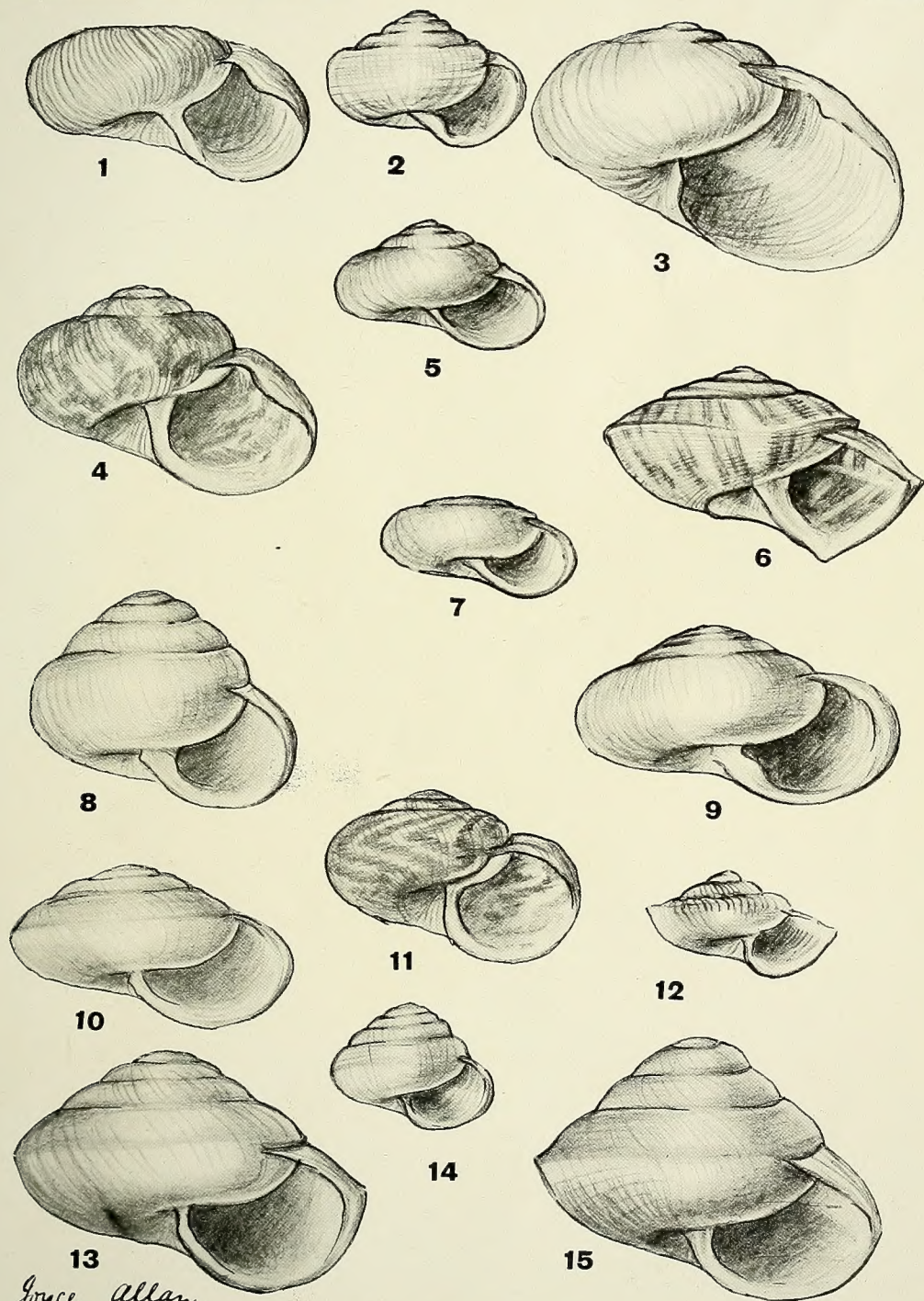
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Land Mollusca of Lord Howe Island.



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